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# FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

**First Aeronautical Weekly in the World. Founded January, 1909**

**Founder and Editor: STANLEY SPOONER**

**A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport**

**OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM**

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### DIARY OF CURRENT AND FORTHCOMING EVENTS

*Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—*

**1933.**
**Mar. 9.** "Engine Cooling Research." Lecture by R. McKinnon Wood before R.Ae.S.
**Mar. 11.** Hanworth Club Annual General Meeting, 8.45 p.m.
**Mar. 16.** "Work of the Central Aerodynamic Institute, Moscow." Lecture by Prof. A. Toupoleff before R.Ae.S.
**Mar. 22.** "The Value of Aircraft for Protecting Seaborne Trade." Lecture by Air Commodore C. D. M. Robertson, before R.U.S.I.
**Mar. 24.** No. 1 Sqdn. R.A.F. Reunion Dinner, at R.A.F. Club.
**Mar. 24.** Bristol and Wessex Ae.C. Dance at Grand Spa Hotel.
**Mar. 25.** Lloyd's Register C.C. Reunion Dinner, May Fair Hotel.
**Mar. 25.** Services Rugby: R.A.F. v. The Army, Twickenham.
**Mar. 29.** "The East African Dependencies." Lecture by H. F. Melland before R.U.S.I. Chairman, Air Vice-Marshal Sir V. Vyvyan.
**Mar. 29.** Royal Aero Club Annual General Meeting, 8.30 p.m.
**Apr. 1.** Women's R.A.F. Dinner, Criterion Restaurant.
**Apr. 6.** "Lessons of the Do.X," Lecture by Dr. C. Dornier before R.Ae.S.
**Apr. 27.** "Seaplane Research," Lecture by H. M. Garner before R.Ae.S.
**Apr. 28.** Junior Ae.C. Dinner to Sqd. Ldr. Gayford and Flt.-Lt. Nicholetts.
**May 10.** Kent Air Pageant and Opening of Maidstone Aerodrome.
**May 16-22.** International Rally, Vienna.
**May 25.** Tourist Rally at Wiesbaden.
**May 27.** Reading Ae.C Annual "At Home."
**May 28.** Deutsch de la Meurthe Cup.
**May 30.** Wilbur Wright Memorial Lecture before R.Ae.S.
**June 8.** Lincs. Ae.C. Air Pageant and Opening of Aerodrome at Holton-le-Clay, Grimsby.
**June 24.** Royal Air Force Display, Hendon.

### INDEX FOR VOL. XXIV.

The 8-page Index for Vol. XXIV of "Flight" and "The Aircraft Engineer," January to December, 1932 (with over 6,463 references for "Flight" and 195 references for "The Aircraft Engineer"—6,658 in all), is now ready and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C.2, price 1s. per copy, net (1s. 1d. post free).

# EDITORIAL COMMENT

OUR full-blooded pacifist is a most pugnacious fellow. Sweet reasonableness is anathema to him. Led by Mr. Lansbury, the pacifist party in Parliament demanded that Great Britain should prohibit the export of arms and munitions of war to the belligerents in the Far East. Mr. Lansbury, as usual, stultified himself by saying that he would prefer to forbid the supplying of arms to Japan but not to China. That was just what one would have expected from him, but he did not press the point and it was not considered. Great Britain is to remain neutral in this quarrel, and to make such a distinction would have been a very reversal of neutrality. Probably, in his heart of hearts, Mr. Lansbury would like Great Britain to declare war on Japan in the sacred name of peace. The line from the old Irish comic song, "Foighting like divils for conciliation and hatin' each other for the love of God," may represent to him a glorious picture of an earthly paradise, but its appeal is not universal. We have experienced one "war to end wars," and have no great reason to be pleased with the result.

**Export of Arms**

The cause for marvel is that the British Government, without, it seems, even waiting for Mr. Lansbury's appeal, did prohibit the export of arms to the belligerents. Thereby it incurred some odium with both China and Japan. China has no armament industry and must import all her warlike material. Japan has some armament firms, and so

is less dependent on imports. The prohibition, therefore, bore the appearance of action against China, and was resented, accordingly, by the Chinese. To Japan our action seemed also unfriendly. We know that the Japanese have a very keen appreciation of our aircraft, and at this juncture she could hardly do better than increase her stock of them.

Other nations did not follow the "gesture" of Great Britain, and possibly some foreign armament firms have booked some profitable orders. The British action harmed ourselves and benefited our trade rivals abroad. It could do nothing to stop the slaughter in the East. From the first it was stated by the best-informed political correspondents that if other nations did not follow our lead we should have to reconsider our position. Now it is admitted that this question will be the first with which the Prime Minister and the Foreign Secretary will concern themselves when they go to Geneva. We may take it for granted that the embargo on British export of arms will be speedily cancelled.

❖ ❖ ❖

**Improving the Breed**

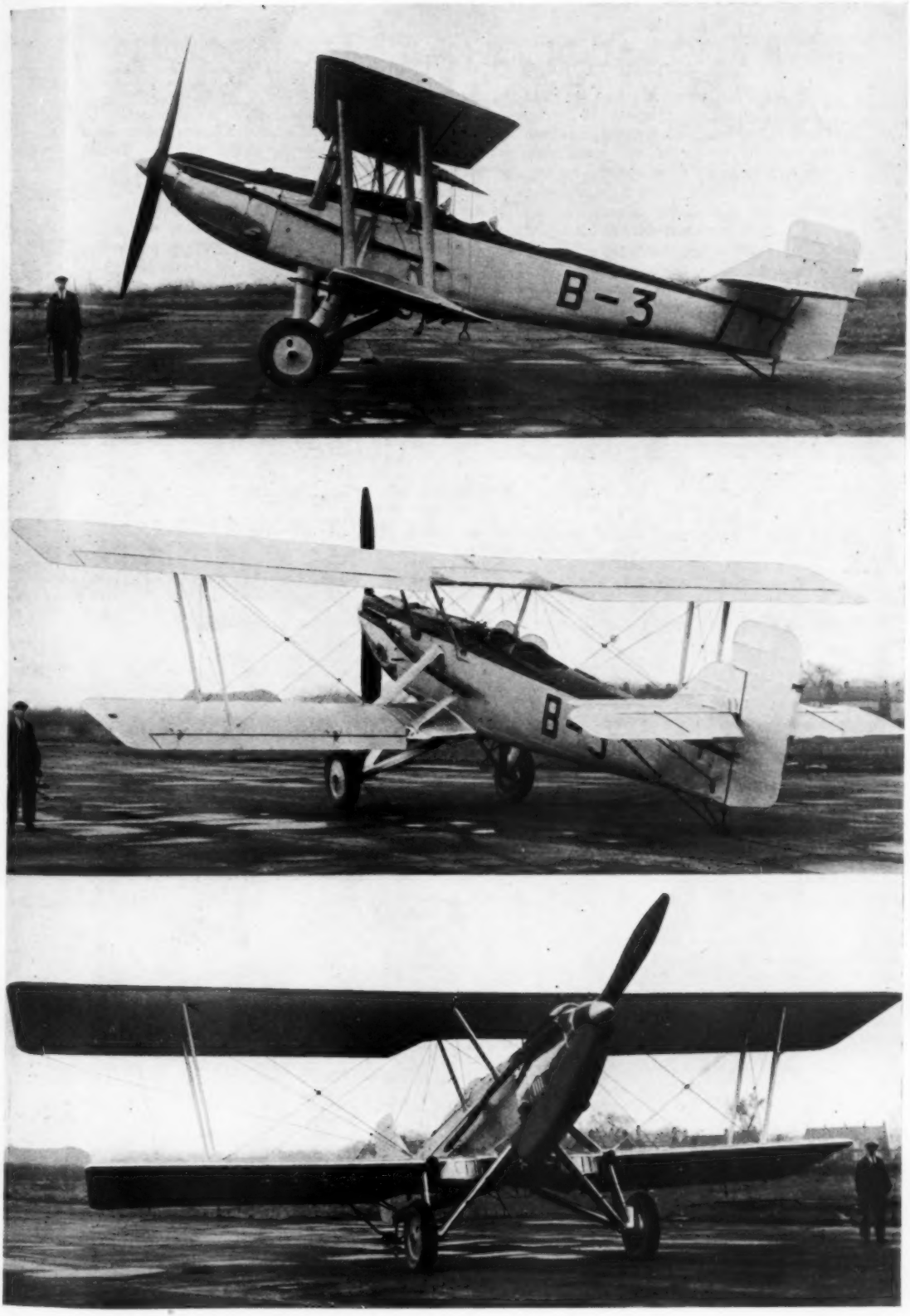
Two main problems still confront the aircraft designer, and presumably always will: How to reduce the drag of his machine, and how to increase the lift. In other words, how to increase the speed range. Some years ago Professor B. Melvill Jones, of Cambridge, did a very real service to the aviation world by setting up, as it were, an ideal for aircraft designers to aim at. In his theoretical machine, perfect streamlining was attained, and the drag was reduced to that induced by carrying a given load on a given span at a given speed, plus pure skin friction. The ideal may, like most ideals, be unattainable. In fact, if it were attainable it would cease to be an ideal. But previous to the work of Professor Melvill Jones it was not really realised what was the maximum efficiency one could hope for, except the picture presented by the "wing-only" aircraft, which is represented by the wind-tunnel tests of any wing model and may reach an L/D ratio of 22-25. The "wing-only," or "all-wing" machine, has not made much headway. In what may be termed its pure form it cannot, for practical reasons, be realised except in very large size. In a compromise form it has materialised in the Burnelli designs, several of which have been described and illustrated in FLIGHT. That the scheme has advantages will not be denied, particularly because very large cabin space is secured without paying quite such a high price (in the form of drag) as one would in a more normal fuselage form of the same cubic space.

Setting aside for the moment the radical departures from normal design, there are still several directions in which the "Ideal Streamline Aeroplane" of Professor Melvill Jones can be approached. The variable area and variable camber wing is one. The mechanical difficulties are considerable, but work is being done in this direction both at home and abroad. A variant of the variable camber wing is the flapped and slotted wing, and here again a good deal of progress is being made. We have described and illustrated several American systems of lift flaps which, at the same time, act as air brakes and thus serve not only to lower the landing speed but to make the gliding angle steeper. Very promising results have been obtained, and it is likely that one or more of these systems may have considerable effects on design in the near future.

A particularly bad offender, especially on fast aircraft, is the exposed undercarriage. Its drag may, on a fast machine, amount to as much as one-fifth or so of the total drag. Yet this part of the aircraft has, for more than 30 years, been regarded by designers as a necessary evil. Signs are not lacking which show that this state of affairs is about to be changed. In every country which produces aircraft new machines are being introduced in which the undercarriage can be retracted into the hull or wings. And when one comes to consider it, it is really rather absurd to carry about, exposed to the air-stream, a component of the aircraft which is in use for a few moments at the start and finish of a flight only, and for the rest is not only so much dead weight, but such a greedy absorber of horse-power.

In this issue we give illustrations and a description of the new monoplane designed and built by the Heinkel company for the German Luft Hansa. This machine is claimed, and probably with truth, to be the fastest commercial aeroplane in the world. On speed figures only this is probably correct, although one might well argue that a machine which carries but four or five passengers with an engine of 650 h.p. is not a *commercial* aeroplane. Major Woods Humphery's paper, an abstract of which is published this week, makes fairly clear Imperial Airways' views on the question of economical operation. It is argued that if one takes a machine capable of 120 m.p.h. and uses it at 110 m.p.h. the saving in petrol and the increase in paying load may amount to anything between £3,750 and £7,500 per annum. Apply the same argument to the Heinkel He.70, and it might be found that by using a smaller engine and resting content with a considerably lower cruising speed, a very economical aircraft would be produced. Put differently, if the drag of a machine is low enough to enable it to attain extremely high speeds, then at lower speeds the power required is low and the "payability" correspondingly increased. Thus, even if one does not regard the Heinkel He.70 as a really useful machine as it stands, the experiment of building it must be considered very well worth while.

In this country also, we are glad to state, efforts are being made to make use of the retractable undercarriage. The new Airspeed "Courier," which is now nearing completion, incorporates this feature, and in it the line of argument just set out has been followed. The "Courier" makes use of a much smaller engine than that of the Heinkel, and the low drag resulting from the retractable undercarriage is used to give very economical cruising at a speed which, while nothing like as great as that of the German machine, is yet considerably above anything we have been accustomed to in machines of the "Courier" class.




THE LATEST BLACKBURN TORPEDO BOMBER SHIP-PLANE : Within the dimensional restrictions imposed, the Blackburn Company have produced, in the M1/30A a very clean machine. The engine is a Rolls-Royce "Buzzard." (FLIGHT *Photos.*)

# International Air Transport

*ANOTHER step has been taken in the efforts which are being made to secure the removal of restrictions affecting the development of international air transport.*

*The Civil Aviation Section of the London Chamber of Commerce has now submitted its views to the Air Ministry and has expressed the hope that it may be possible for the British representative to raise the matter at the next Conference of the International Commission for Air Navigation. These representations are supported by the Royal Aero Club, the Society of British Aircraft Constructors, the Guild of Air Pilots and the Automobile Association.*

*It will be remembered that the Section has advocated the abolition of permits which are required by certain countries before an aeroplane is allowed to fly over their territory and which often takes many days to obtain. It has also suggested that the Pilot's licence should be substituted for the passport with its necessary visas in the case of pilots of recognised air transport undertakings and that Customs procedure for aircraft and their contents should be standardised in all countries,*

*The Section's views have received the support of many Chambers of Commerce on the Continent who have now been asked to approach their own Governments, as it is pointed out that international co-operation (a very different proposition from "International Control"—Ed.) is essential if success is to be achieved.*

# MECHANOPHOBIA

## The Situation Reviewed by Ivor McClure

MAN made a pretty good fool of himself over the motor car. He began with red flags and had just graduated out of speed limits when Oxford jumped out of the dead history book in which she lives and clamoured to have police traps again. The scholarly mind that thought of controlling the lethal vice of speeding by means of two scrubby looking men with stop watches may have borrowed the idea from the Chinese *tuchun* who balances his petty cash by "controlling" the opium traffic. In America it is called a "racket."

It might be derogatory to Oxford to say that she reflects the wisdom of the greater world outside her borders. She certainly reflects some of the hebetude. The speed limit mind has applied itself to aeroplanes. Restrained, marvellous to relate, from imposing limits of speed in the air, the resources of folly were not exhausted. There have been established areas over which you are not allowed to fly *above* a certain height; therefore, if your engine should stop, you are certain to kill yourself.

Safer but hardly less silly are most of the forbidden areas over which you are prohibited from flying. Family groups of petrol tanks and explosive factories are best avoided by airmen, but there are hundreds of square miles of territory over which you may wander on foot and see pretty well everything there is to see, but over which you may not fly in an aeroplane from which you can see comparatively little.

Another restriction which only bears investigation by the Commissioners for Lunacy are the aerial corridors, the prescribed places by which alone you may cross certain frontiers. In God's name why? If you fly above the clouds or at 15,000 ft. in a Comper "Swift" what is the good of an aerial corridor?

It would be unfair to regard as fatuous the countries that wish to be warned of your coming by air. In the past air visitors have not descended on them with the same sickening freedom as quails did upon the Jews. A telegram forty-eight hours in advance enables them to dust and put the aerodrome straight against your arrival. There are only two such countries in Europe, and they are among those most worth visiting.

The really naughty countries are those that have prohibited themselves. You cannot enter them by air unless you have obtained special permission. These permits are not like visas and police-traps, solely a means of raising revenue; they do not even serve that comprehensible purpose, for some of them are issued free. At their best they are a complication and a nuisance, at their worst an intolerable delay.

Is intolerable too strong a word? Think, man! Your uncle wires you from Istanbul that he has interrupted an expensive cruise to have a stomach ache. He expresses a desire for the comfort of your companionship. The marigolds will be waving on his grave before you can reach him in your own aeroplane in which you could fly the distance in a day.

Think, woman! Your sister feels that she can no longer conceal from you that she allowed your Pekinese to escape from the hotel in Riga. She (the Pekinese) will have had Alsatian puppies before you can fly the eleven hundred miles in your "Puss Moth." Too late are your tender ministrations.

To what is this state of affairs due? The cause is mechanophobia, the unreasoning panic that attacks so

**Map of Europe showing where you may, or may not, fly. Countries shown white are non-permit areas.**

many people after they have passed middle age. The symptoms do not show themselves until the sufferers are brought into contact with the feared machine. The train was once a terror, the motor car was and is still a source of panic, while the aeroplane induces lunacy. The sad part is that the most cultured minds are the most liable to infection.

The international body that makes rules about aeroplanes is composed of cultured or scholastic gentlemen who are—well, no longer quite young. The fact that they do not protest against the wild enactments of their member states is proof of the ravages that mechanophobia has made in their ranks. They are drifting rudderless in a sea of saliva.

The rules the ICAN makes are broken by its own members. Contracting States should permit to fly over their own territory the aeroplanes of other contracting States. Jugoslavia, Bulgaria and Poland, all contracting States, forbid our aircraft to fly over their respective territories unless special permission has been obtained. Poland prevaricates a little by calling the permit something else, but, as Shakespeare said, "nerts" by any other name. . . .

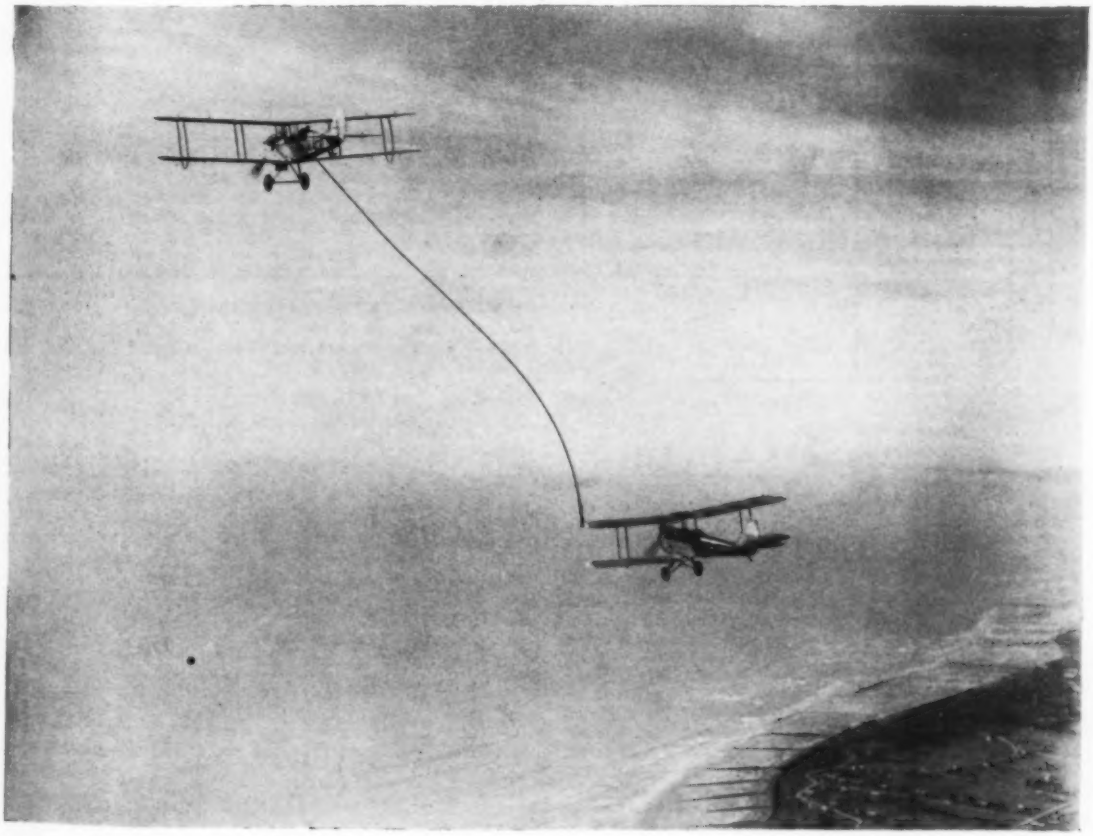
What is being done about this? Mine is no voice bawling in the wilderness. I merely wish to draw your attention to a ridiculous and phantasmagorical state of affairs so that you can, on a suitable occasion, lend your support to the agitation for a return to sanity that is now being conducted by the Aviation Section of the London Chamber of Commerce. As I write these lines the news arrives that the pilots of the Houston-Everest Expedition are shooting crap, playing snakes and ladders, or otherwise trying to kill time in Baghdad waiting for permission to fly peacefully across Persia. *It is a little over a month ago since they applied by telegram for the permit.* The conditions outside Europe, you see, are very, very much worse.

# NON-STOP TO AUSTRALIA

ORGANISATION is one of the strong points of Sir Alan Cobham's make-up. He goes into every detail before he starts upon any long-distance flight, with the result that he is successful. A flight which entails refuelling some three or four times during the journey and which relies upon making contact with an aeroplane in the air, taking from it anything up to a ton of fuel, and that, irrespective of the weather, must of necessity demand from the organiser a masterpiece of organisation.

Down at Ford Aerodrome, the site of the South Downs Aero Club run by Rollason Aviation Co., Ltd., Sir Alan spends much time practising everything which will help the smooth working of his project.

There we recently saw him carrying out experiments with different hose lengths and weights when lowered from a D.H.9 flown by Sqd. Ldr. Helmore, while he himself flew a "Moth" below and studied the art of making contact with the dangling hose. Through the help of Mr. Nash, the club's instructor, who placed a school "Moth" at our disposal, we were able to obtain the photograph shown below of Sir Alan's work.



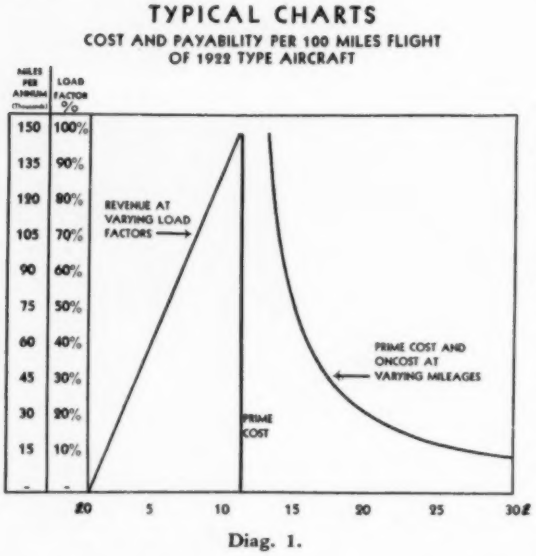
**PRACTICE MAKES PERFECT: Sir Alan Cobham and Sqd. Ldr. W. Helmore practising making contact in preparation for their forthcoming non-stop flight to Australia. Sir Alan is in the "Moth" below the weighted hose.** (FLIGHT *Photo.*)

# AIR TRANSPORT

## IMPERIAL AIRWAYS REVIEWED

IN the absence of Maj. G. E. Woods Humphery, managing director and general manager of Imperial Airways, Ltd., his paper was read before the Institute of Transport on February 13 by Lt. Col. J. Barrett-Lennard, C.B.E., who is a director of Imperial Airways. Maj. Woods Humphery's paper was entitled "A Review of Air Transport," a somewhat misleading title, since the paper dealt exclusively with the life and history of Imperial Airways, Ltd.

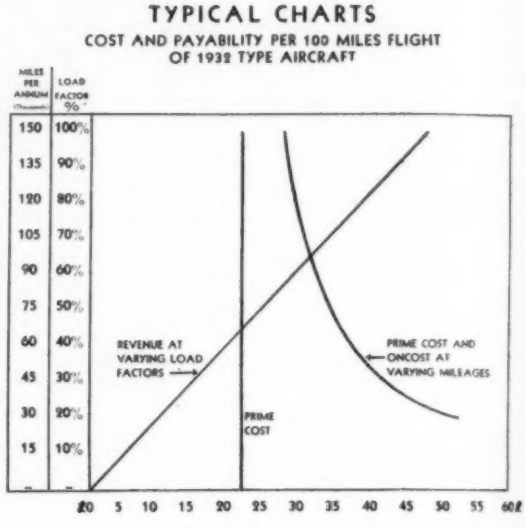
Out of a very long paper it is impossible for us to do more than give a brief abstract relating to certain features of the development of Imperial Airways. In his paper Maj. Woods Humphery pointed out that in the early days of air transport, economic problems were somewhat overshadowed by the technical difficulties. In those days (*i.e.*, 1924-25) aircraft could not be operated so as to produce even a *gross* profit on the actual out-of-pocket cost of flying, so that every additional mile flown (over and above that demanded to qualify for the subsidy) increased the loss. The main question with which an air operating company is faced was expressed: "How to carry the largest volume of traffic, in the fastest time, in the greatest safety, regularity and comfort, and at the lowest economic fares."




Diag. 1.

The effect of the principal compromises can be seen from Imperial Airways' "Payability Charts." These charts are prepared for each type of aircraft, on each route or section of route, showing its operating cost and the revenue it can earn at varying percentages of capacity sold, and at fares that will attract the volume of traffic required, and expressed for the purpose of comparison on the common basis of a flight of 100 miles.

Diagram 1 shows a graphical illustration of the economics of a single-engined type of aircraft in service from 1922-1925. The prime cost, shown by the perpendicular line, consists of those items, *i.e.*, fuel, oil, maintenance, etc., of which the cost varies directly with the mileage, and is consequently almost constant in amount for any flight over the same route, although it will be entirely different for a different route. The operating oncost (obsolescence, insurance, officers' salaries and crews' wages, etc.), being fixed annual charges, can only be expressed as a mileage or ton mileage cost provided that a figure of annual mileage is assumed. The curved line shows the cost per 100 miles flight of the items which comprise the prime cost and, in addition, the operating oncost for varying mileages up to 150,000 miles per annum. Revenue for all the percentages of capacity filled, between



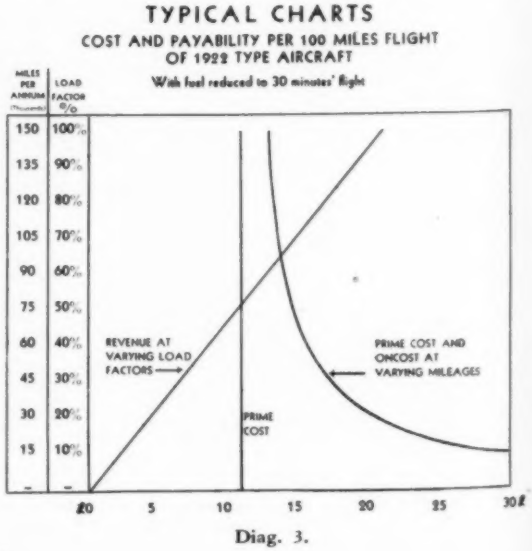

Diag. 2.

empty and full, is shown by the sloping line. It is seen that on the route for which the chart is calculated, this type of aircraft could not cover its prime operating cost, even if it carried full load.

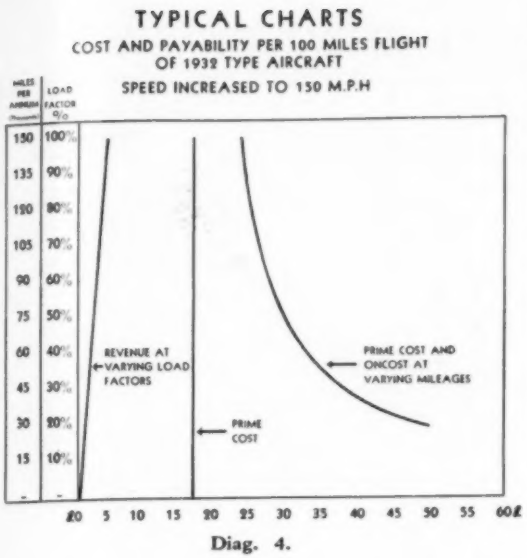
In spite of increased power, speed and comfort, the machine of a decade later (diagram 2) has an economic picture which looks vastly more attractive.

Assuming that it had been commercially possible to reduce the fuel of the 1922-25 machine to a range of 30 minutes' duration, making some four or five landings en route to Paris, then the payability chart would look as shown in diagram 3. The reduced range would have increased the pay load by about 100 per cent. With this increased load the old machine would have earned its prime operating cost at a load factor of 53 per cent., and would have covered its oncost as well if it were operated for 100,000 miles per annum at a load factor of 67 per cent.

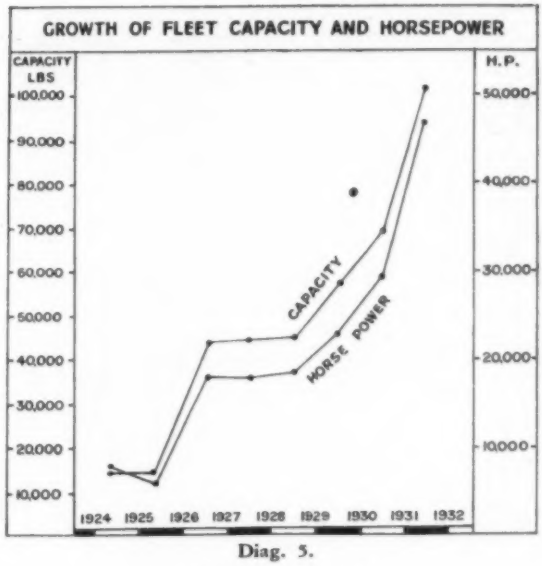
To show the cost of speed, Maj. Woods Humphery gave diagram 4, of a modern machine with speed increased to




Diag. 3.




Diag. 4.




Diag. 5.

150 m.p.h. by increasing horse-power. From being an economic unit capable of earning gross profits, the machine would become less profitable than the aircraft of a decade ago. This represented an extreme case, and the machine would not be as bad as depicted if designed *ab initio* with the objective of achieving higher speed. For example, a more practical although hypothetical machine might be assumed to require 3,000 h.p. to propel it at 120 m.p.h. If this speed were reduced by 10 m.p.h., to 110 m.p.h., only increasing the duration of journey by about half-an-hour on a 700 miles run, the pay load could be increased by 750 lb. by the saving in fuel. This saving would represent an increase in potential earning capacity of anything between £3,750 and £7,500 per annum per machine, to which must be added the saving in fuel cost.

Maj. Woods Humphery explained in the paper the reasons for the policy of larger aircraft which Imperial Airways have followed in recent years. The growth in power and capacity of the fleet are shown in diagram 5, while a comparison of the more interesting features is made in diagram 6.

**COMPARISON OF SALIENT CHARACTERISTICS OF 1922 AND 1932 AIRCRAFT**

| | 1922 | 1932 |
|---|---|---|
| NUMBER OF ENGINES | 1 | 4 |
| TOTAL HORSE POWER | 450 | 2,220 |
| TOTAL WEIGHT (LBS.) | 7,200 | 30,000 |
| WEIGHT PER H.P. (LBS.) | 16·0 | 13·5 |
| SPEED M.P.H. STALLING | 61 | 47 |
| SPEED M.P.H. MAXIMUM | 115 | 127 |
| SPEED M.P.H. CRUISING | 95 | 105 |
| NORMAL RANGE (MILES) | 300 | 300 |
| NUMBER OF CREW | 2 | 4 |
| PAYING LOAD (LBS.) | 1,100 | 6,370 |
| PAYLOAD PER H.P. (LBS.) | 2·4 | 2·87 |
| NUMBER OF PASSENGERS | 6 | 38 |

Diag. 6.

## South African Air Services

AIR transport between Durban and Johannesburg, a distance of about 400 miles, has developed with enormous rapidity during the last few months. About a year ago the Union Airways began a regular passenger service with one "Puss Moth" between the two centres once a week. The demand for accommodation was so great, however, that at the end of the first month the service was increased to three flights in each direction weekly. The service was operated with such regularity and freedom from delays that the Union Government has now granted the company the mail-carrying contract between Durban and Johannesburg and return. This has resulted in a great saving of time, and mails, which formerly took a day and a night to pass between the two points, are now delivered within a few hours of posting. The service has also been linked with Imperial Airways at the Rand airport, so that London has been brought another day nearer Durban. Letters posted on a Wednesday in Durban can now also reach Salisbury in one day, compared with three last month. With every passing month the demand for accommodation has increased, and the company has been compelled to dispense with the "Puss Moth" and use a seven-seater Junkers in its place. Another company, the Arrow Air Lines, which operates a regular service to Lourenco Marques, has now also come into the field, and a five-day service between Durban and Johannesburg has been created in less than 12 months.

## Air Mail to Rangoon

A RESOLUTION recommending a reduction in postal rate by air mail in India, suggesting a reduction to at least a level with the United Kingdom-India rate, was adopted recently at the annual Conference of the Associated European Chambers of Commerce, in Calcutta. The Burma European Chamber, while appreciating the concessions recently made by the Government whereby the services of Dutch and French lines could be utilised for the carriage of letters outside India from Calcutta, Akyab and Rangoon and from Rangoon to Calcutta, strongly recommended to the Government of India to make arrangements for the introduction, at the earliest date, of a British or Indian air mail service. They also suggested the service across India should be permitted to carry passengers and mail of all kinds between points within India as well as to and from points outside India. The resolution further recommended that before a trans-India service was inaugurated, the public should be allowed to utilise to the full the advantages offered by the Dutch and French air services at present plying across India.

## Sahara Air Mail

A REGULAR air mail service across the Sahara is shortly to be organised. The mails will be carried on service machines, and the route will be from Algiers and Zinder via Colomb Bechar, Reggan, Bidon, Gao, and so to Niamey.

# THE "FOX MOTH" IN NEW GUINEA

ON several occasions we have referred to the activities of Guinea Airways—we gave a fairly detailed review of aerial transport in that country in our issue of January 23, 1931—one of the few unsubsidised air operating concerns that is paying its way and achieving continued success. We are now able to publish some extracts of a letter received by the de Havilland Co., Ltd., from Maj. de Havilland, who is at present in New Guinea delivering two "Fox Moths," which are being used for communication between the Gold Mines and Salamoa.

Maj. de Havilland writes (dated January 1, 1933):—

"The *raison d'être* of the place (Salamoa and surrounding area) is, of course, gold. The largest mines are Bulolo, Edie Creek, and Watut. Between them they turn out over £70,000 of gold per month. Bulolo is 34 miles from here, directly inland, and there is only a mule track leading there, which has to go over a pass 6,400 ft. high. It takes 12 days by track and 35 minutes by air.

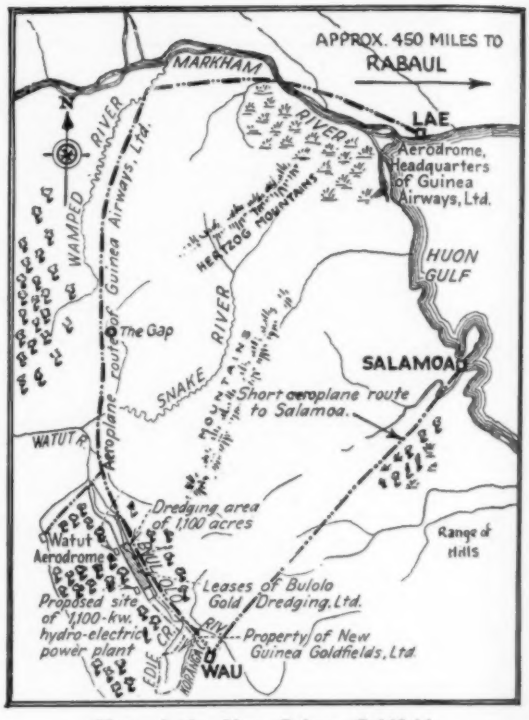
"The whole of the supplies for the mines, therefore, go up by air, including cattle, sheep, beer, motor-cars and dredging machinery. Junkers three-engined '31's' take the big stuff, up to 4½ tons per load per trip, and they certainly perform very well. The return trip takes 50 min. to an hour, and on fine days one can do eight or nine trips.

"I got the first 'Fox' going two days ago, and started her off with 350 lb. in the cabin. Now we have done 14 trips and are taking 675 lb. in the cabin per trip. The pilots flying them are Mant and Ferguson.

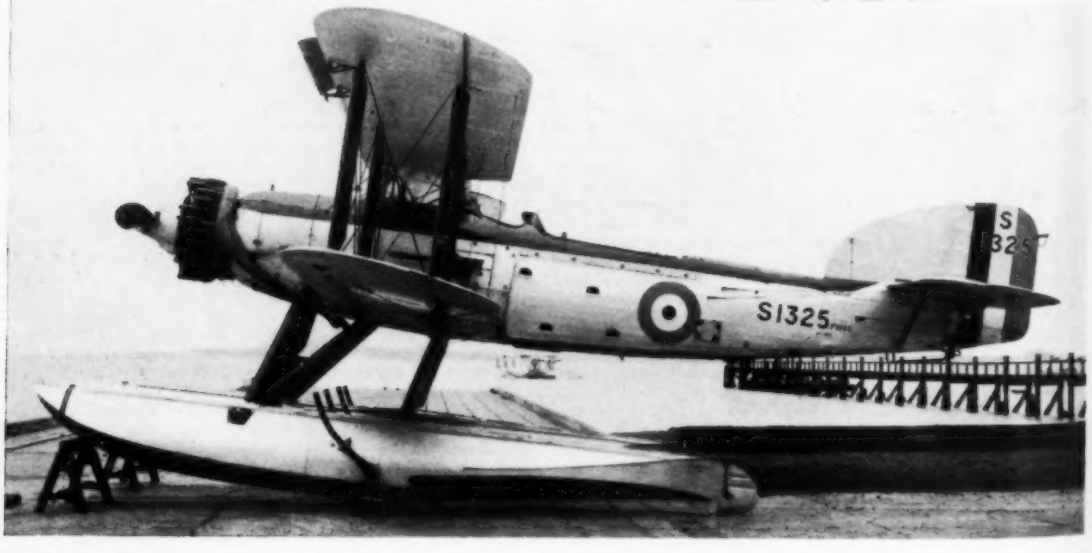
"The aerodrome here is at sea level, 600 yd. long and 100 yd. wide. You take off and climb to 7,000 ft. to clear the hills, and then shut off and get down to the Wau aerodrome as quick as possible; this means losing about 4,000 ft. more or less vertically, as it is in a steep valley. Wau aerodrome itself is at 3,200 ft., is 700 yd. long and 120 yd. wide, and has a gradient of 1 in 12. You taxi up to the top and turn sideways on to the gradient, and jam the brakes on. It is rather strange gliding in at 90 or so on the 'Fox' and then pulling up dead. There is no hope at all of landing anywhere between here and Wau, but there have only been two forced landings in the past four years.

"It is amazing the amount of flying that is done. There are three three-engined ('Hornet') Junkers, four single-engined ('Jupiter') Junkers, a Fokker, two D.H. 50's, one D.H.9, three 'Moths' and two 'Fox Moths,' and a D.H.61. The average load carried daily to the Wau and Bulolo is 60-80 tons, composed of food, cars, people, machinery, corrugated iron, beer and whisky, and other odds and ends. The 'Fox' is really surprising. She takes off in about 250-275 yd. with 650 lb. of stuff in the cabin with no trouble at all.

"The D.H.61 takes 2,000 lb. pay load, and has now done 2,900 odd hours' flying, with practically no machine replacements except two wings as the result of a crash."




**Map of the New Guinea Goldfields.**

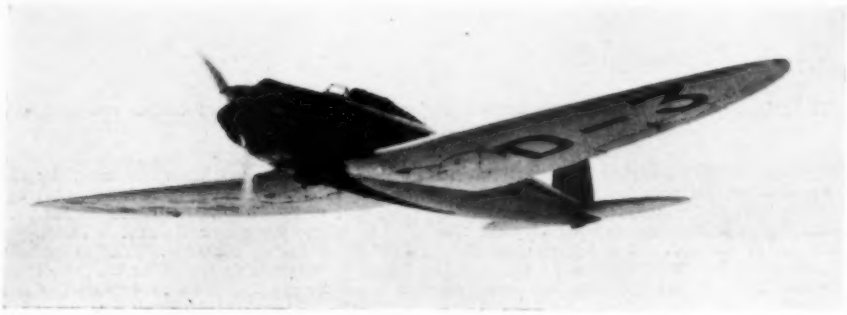



**THE FAIREY "SEAL": Developed from the Fairey "Gordon," a day-bomber, general purpose and Army co-operation type, the "Seal" is, like the "Gordon," fitted with the Armstrong-Siddeley "Panther" engine. It is, however, a twin-float seaplane and has been ordered for work with the Fleet Air Arm.** *(R.A.F. Official Photograph. Crown Copyright.)*

# The Heinkel He.70

*By Edwin P. A. Heinze*

## GERMANY PRODUCES THE FASTEST TRANSPORT PLANE



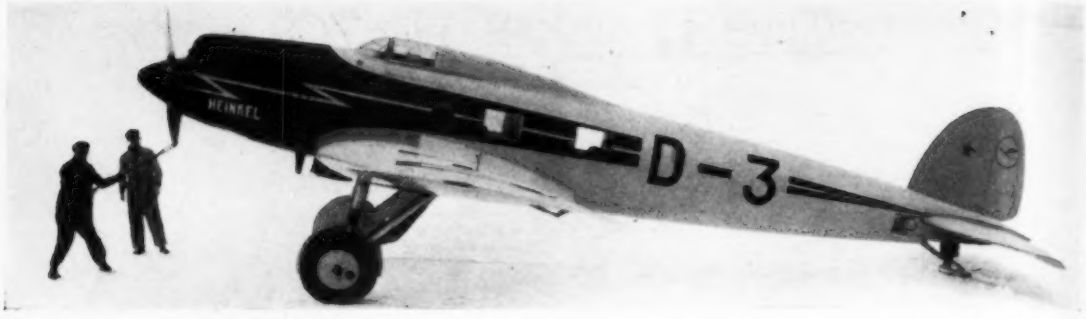
**WITH WHEELS RETRACTED : The He.70 in flight.**

IN remarkably short time German engineers have succeeded in catching up the lead of other nations in the design and construction of fast transport planes. This is the impression conveyed by the inspection of the latest Heinkel product, a monoplane for a crew of two and four passengers capable of a maximum speed of 228 m.p.h. To appreciate this achievement it must always be remembered Germany has no military air fleet and no industry adequately subsidised to enable it to carry on development work on a sufficiently extensive scale.

To the order of the German Transport Minister, the Heinkel Company started work on a fast mail and passenger plane in the summer of 1931. The design was hardly completed and accepted when the appearance in Europe of the Lockheed "Orion" machine purchased by Switzerland brought home the need for a much faster machine than the one just finished "on paper." The German authorities immediately gave instructions to leave the old design and start on a new. But no one in Germany had experience in the construction of such high-speed machines, and so two Heinkel engineers were sent for studies to the United States. When they returned from that visit, the new machine now completed was evolved. Already the first tests revealed its performances to be considerably higher than that guaranteed by the designers. Instead of a guaranteed maximum speed of 314 km./hr. (195 m.p.h.) the top speed was found to be 362 km./hr. (218 m.p.h.). At 65 per cent. of the full engine power of 630 b.h.p., that is with 410 b.h.p., supplied by the water-cooled BMW-VI engine, the very satisfactory cruising speed of 326 km./hr. (203 m.p.h.) was attained.

The new Heinkel plane has a low cantilever wing of 14.8 metres (48.55 ft.) span and an over-all length of 11.3 metres (37 ft.). The wing area is 36.5 square metres (392.8 sq. ft.). In the hands of the chief test pilot, Herr Junck, the machine has already succeeded in beating an

**150 B.H.P. PER PASSENGER : With four passengers and a crew of two, the He.70 is credited with a maximum speed of more than 220 m.p.h.**




**STREAMLINING: The slim form and absence of projections on the Heinkel He.70 are well shown in this photograph.**

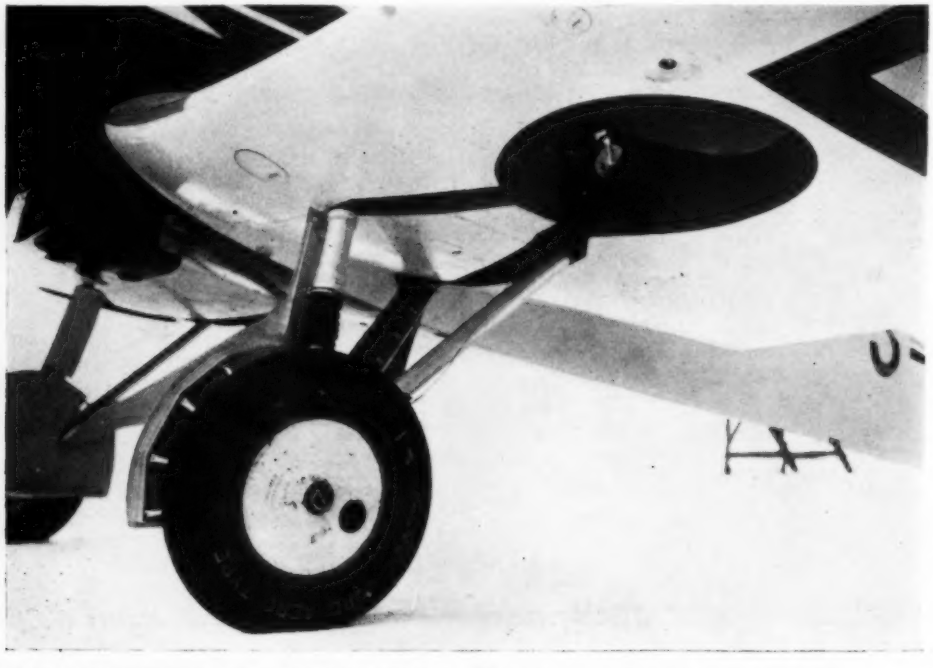
international record over 100 kilometres closed circuit in the 500 kg. pay-load class, hitherto held by an American pilot on a Lockheed "Vega" machine. The new record stands at 348 km./hr. (216 m.p.h.), comparing with 299 km./hr. (186 m.p.h.) of the old. It has been passed on by the German Air Board for homologation by the F.A.I.

The aerodynamical form of the machine has been developed at Göttingen, and the utmost care has been applied to the elimination of all projections increasing head resistance, down to such details as door handles and window recesses. The all-metal fuselage is oval in cross-section, and its duralumin skin has been attached to the frames by means of countersunk rivets, giving an entirely smooth outer surface, which is not broken by the windows and the door, as these are flush with the skin. The pilot's head is above the fuselage top, but is covered by a streamlined hood.

Incidentally, the technical managing director of the Luft Hansa, Herr Milch, who was recently appointed Secretary of State in the Aviation Department of the German Transport Ministry, while introducing the new machine to members of the press, told how careful streamlining and elimination of projecting parts causing head resistance on old machines had very considerably improved their performance. So, for instance, the top speed of an old Junkers F.13, a design over ten years old, and of which type many machines are owned by the Luft Hansa, has been raised 23 km./h. (14.3 m.p.h.) by such means, and that of the Rohrbach Roland 33 km./h. (20½ m.p.h.).

The wing of the new Heinkel is entirely made of wood and has rounded contours. The ailerons have no slot, but a rectangular extension or tongue of their lower skin in the centre, lying in a cut-out of the main wing skin, forms a cavity in the under-surface of the wing when the aileron is pulled down. The *empennage* is strutless, and the rudder as well as the elevators have little flaps of the Flettner type on their trailing edges to reduce loads on the controls. The tailplane can be adjusted during flight.

The undercarriage and the tail skid are simultaneously retractable, and a rather interesting solution for this important problem has been found. The wheels are swung up sideways and disappear in the under-surface of the wing, in cavities which are completely covered by skin pieces permanently fixed on the wheel struts. The raising and lowering of the landing gear is effected hydraulically, but in the event of the hydraulic system failing a mechanical system is also provided. The machine has to take off with the wheel recesses uncovered. A signal plant is incorporated, which causes a lamp to light up and a Bosch signal horn to sound the moment the engine is throttled for landing if the wheels are not in the "out" position. The movement of the undercarriage in or out



**THE "HOCHZIEHBARES FAHRGESTELL": Otherwise the retractable undercarriage. The Palmer wheels disappear completely in the wing recesses.**

**"AND WHEN THEY WERE ONLY HALF-WAY UP" : The He.70 with undercarriage in intermediate position.**

in no way affects the balance of the machine. Also a normal three-point landing is possible with the Heinkel. In addition to the retractable landing gear also the radiator under the fuselage is made retractable. The engine is furnished with a "hot-cooling" system by the use of Glycol as a cooling medium instead of water. Glycol does not begin to boil before a temperature of 120 deg. C. is reached, so that a smaller radiator can be employed.

The landing speed of the machine is 110 km.p.h. (68 m.p.h.), which is no higher than that of certain American machines. But it is still considered too high, and a new machine is now being built with trailing edge flaps to reduce landing speed.

The new Heinkel is equipped with a wireless set and blind-flying instruments. Including these and the cabin furniture, lamps and all the usual installation, the machine weighs 2,360 kg. (5,190 lb.). With a crew of two, fuel for 3 hr. and a pay load of 500 kg. (1,100 lb.) consisting of four passengers and luggage or mail, the machine weighs 3,370 kg. (7,414 lb.), which amounts to a wing loading of not quite 19 lb./sq. ft., and a power loading of not quite 12 lb. per brake horse power at maximum engine output of 630 h.p. Other, especially structural, details are not available at the moment, and it remains to be seen whether the new design will fulfil in normal service what it promises now. The machine will rise to 1,000 m. in 3.4 min., to 2,000 m. in 7.1, to 3,000 m. in 11.5, to 4,000 m. in 17 and to 5,000 m. in 25.4 min. Service ceiling is 5,700 m. These performance figures were attained with one and the same propeller setting of 28.75 deg.

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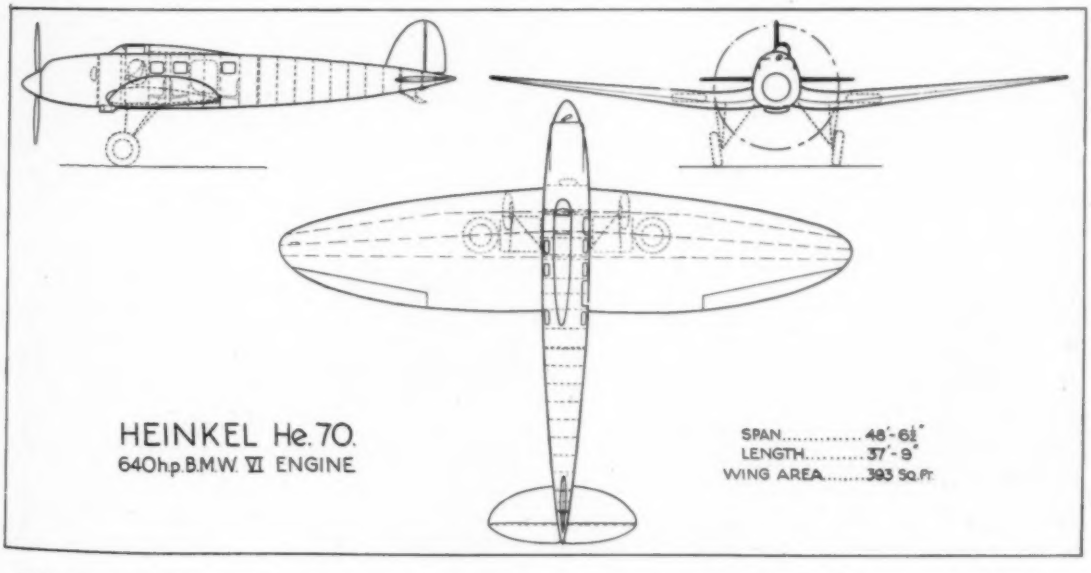
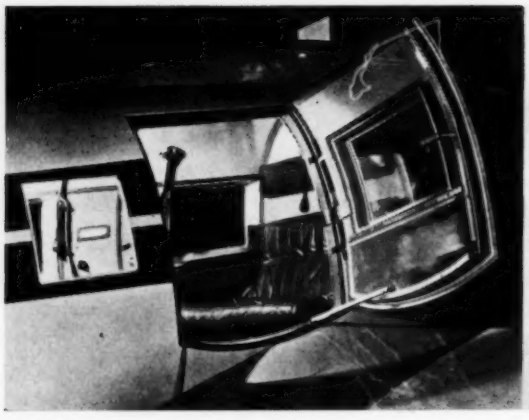
# SOME COMMENTS ON THE HEINKEL He.70

SINCE above article and photos arrived from Herr Heinze we have received direct from the Heinkel Company of Warnemünde further particulars and illustrations. Some of the latter will be found on this and the next page. That the He.70 is an outstanding machine will not be denied. That it is the fastest aeroplane ever produced by a German aircraft firm goes without saying, and that what is claimed to be the world's fastest commercial aircraft should come from one of the pioneer aircraft constructors in Germany is gratifying to




**THE HEINKEL HE.70 : Three-view general arrangement drawings. The engine is a B.M.W.VI ungeared, of 640 h.p.**



**THE REVENUE DEPARTMENT : On the left the cabin door open shows the front seats, and on the right are seen the two aft seats. Blue leather upholstery is used.**

those who remember the early struggles of the pioneers, and who have lived to see so many of these pioneers gradually drop out of the aircraft industry.

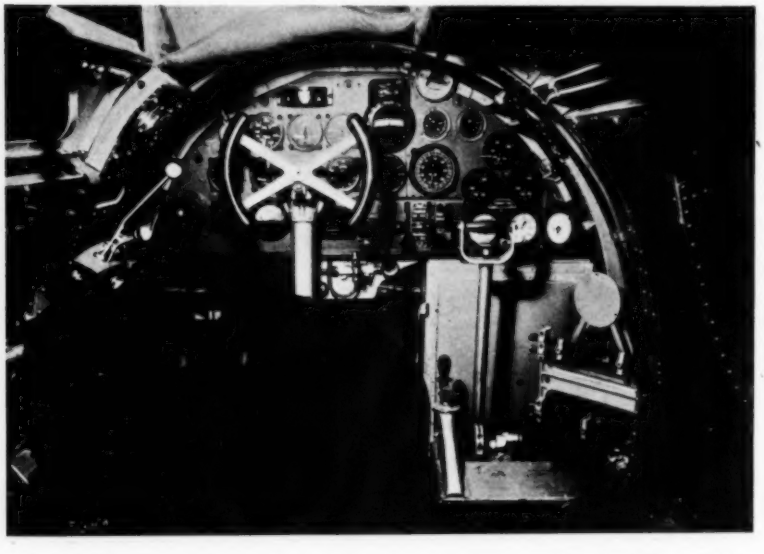
In his article Herr Heinze refers to the machine as having accommodation for a crew of two and four passengers. Actually, we are informed that five passengers can be carried, four in the cabin and one in a folding seat behind the pilot. This brings the power expenditure down to 130 per paying passenger, which is certainly still high, but not outrageously so in view of the cruising speed of 200 m.p.h. or so. Looked at in another way: The He.70 has a tare weight of 5,060 lb. The gross weight is 7,282 lb., leaving a disposable load of 2,222 lb., which represents about 3½ lb./h.p. The actual pay load (*i.e.*, disposable load after deducting weight of crew, fuel and oil) is 1,100 lb., or approximately 1¾ lb. per horse-power. We have no figures for the fuel consumption at cruising power, but as the machine normally carries 114 U.S. gallons of petrol, it may be assumed that the cruising range is somewhere in the neighbourhood of 3 hr., or approximately 600 miles, depending upon the percentage throttle use at cruising power.

In this connection it is interesting to draw a comparison between the Heinkel He.70 and the new Mailplane now nearing completion at the works of Boulton & Paul, Ltd. The British Mailplane, it will be remembered, was designed to meet a specification calling for 1,000 lb. of mails carried over a distance of 1,000 miles, at not less than 150 m.p.h. The machine actually promises to exceed this cruising speed considerably, and its range will definitely be greater than that of the He.70. In addition, the Boulton & Paul Mailplane has two engines and will be able to maintain flight with one engine stopped, so that a very valuable safeguard against forced landings will be provided. It is probably a slightly more expensive machine than the He.70, but the extra reliability afforded by the second engine should make the extra expense worth while. The British machine, it should be mentioned, is not designed to carry any passengers, its load consisting entirely of mails. If the Luft Hansa should decide to put the He.70 on the London-Berlin route, it is interesting to reflect that it would do the journey in about 3 hr.!

Aerodynamically the He.70 is remarkable for the extreme cleanness of the design. The Everling "High-speed Figure," which is a measure of the minimum drag coefficient, reaches the record value of 48.2, which is above what Prof. Everling originally estimated as the maximum theoretical value of the "ideal" machine.

The wing loading of the He.70 is approximately 18½ lb. per sq. ft., which is not a figure that can be regarded with equanimity in a machine of such clean design and not fitted with air brakes. If some form of air brakes and variable lift device, such as the split trailing edge flaps of the Northrop "Sky Chief" described in FLIGHT several weeks ago, can be fitted in a later version, the high unit loading may become tolerable.

One of the views on this page shows an amazing array of instruments. At first one is puzzled by the need for all these in a single-engined aeroplane, but it should be remembered that the machine is fitted with transmitting and receiving wireless, and is also equipped for night flying and for "blind flying."



**"THE OFFICE" : The number of instruments appears excessive, but the machine is equipped with night-flying and blind-flying instruments.**

# The Vickers G.P. "Vildebeest"

THE Vickers "Vildebeest" (Bristol "Pegasus" I.M.3 engine), with which, in its torpedo-bomber form, certain units of the Royal Air Force are now being re-equipped, has also been fitted out as a "general purpose" aircraft. In this form, the machine has a normal disposable load (including crew and fuel) of approximately 3,850 lb., the tare weight of the aircraft being approximately 4,250 lb. With normal petrol, the machine has a duration of 625 miles, cruising at 121 m.p.h. (the maximum speed, at 4,920 ft., is 142 m.p.h.), but this range can be extended to 1,250 miles by the addition of an auxiliary fuel tank carried in the position normally occupied by the torpedo. At the normal all-up weight, the aircraft climbs under ideal conditions to 6,560 ft. (2,000 metres) in 9.6 min., the initial rate of climb being 765 ft./min., with an absolute ceiling of 19,000 ft. The landing speed is 56.5 m.p.h.

The "Vildebeest" in "general purpose" form can also be equipped with a twin-float undercarriage in place of the wheels.

**The "torpedo tank" increases the range to 1,250 miles. The machine can also be fitted with float undercarriage.**

# FROM THE CLUBS

## LONDON AEROPLANE CLUB

The milder weather has brought an influx of new members, among them being Messrs. Steenfeldt, B. Davison, W. Riggs and J. Sibthorbe. Mr. Wilson has passed his "A" licence and is putting in hours in his own "Moth."

## HANWORTH (N.F.S.)

A great deal of cross-country flying has been done during the past week. On Sunday Sqd. Ldr. Helmore flew down to Ford; on Monday Capt. Findlay flew a press photographer in a Desoutter over the flooded Thames area; on Tuesday Mr. J. Mason arrived with his wife (Miss Diana Coventry) after their wedding, and were flown by Capt. Findlay to Paris; on Wednesday Mr. Adinsell flew to Farnborough, and on Thursday to Martlesham; also on the same day Mr. Dockrell flew with Capt. Findlay to Castle Bromwich for the B.I.F.; and on Saturday Maj. Mealing was flown to Oxford to inspect a new landing ground.

N.F.S. have designed, and are fitting, a special light wheel spat or mud guard for "Puss Moths" and "Gipsy Moths." Members who have had them fitted to their machines find them a great boon in the muddy weather.

On Saturday evening, March 11, the annual general meeting will be held at the club-house.

## BROOKLANDS

The School has been very busy during the past week, and as the prospects of a record season are good it has been decided to purchase another machine, "Gipsy Moth" AAIC. New pupils include Messrs. Spear, Cook, Andrews and Vivian; Messrs. Barr, Midgley and Stabb have been on cross-countries, Mr. Quilter has been flying a Klemm, and Mr. Hordern has been piling up hours.

A large party of children from the Ottershaw Children's Homes paid a visit to the aerodrome lately and were greatly interested in the flying, especially Mr. Lowdell's exhibition of "crazy flying." The Junkers air taxi belonging to Brooklands Airways, Ltd., has gone to Dessau for its C. of A., piloted by Capt. Ledlie; Capt. Ledlie also made a press flight in a "Puss Moth" with a photographer as passenger to photograph the Thames floods.

Considerable alarm has been caused lately by persistent rumours of a Tramp's Meeting being held at Brooklands on March 18. One nervous member was heard to remark that he did not mind children's parties, but to allow Weary Willies the freedom of the aerodrome was going too far. Other members thought that the instructional staff had gone on strike and intended to sell matches in the paddock. The truth is that a Tramp's Party is to be held by members of the Club; tramps' clothing will be the order of the evening and a real London coffee stall is to be installed on the tarmac. Supper will consist of "fish and chips" and "soss and spuds" (what's wrong with whelks and "tripe and onions"?). Tickets are 5s. each.

Efforts are being made to compile a complete list of all pilots who have ever used Brooklands Aerodrome. Anyone having information about early Brooklands pilots are asked to send particulars.

## CINQUE PORTS FLYING CLUB

The weather has again been poor, but quite a lot of school and solo flying has been done, including a first solo by Mr. Geoghean. Visitors included Mr. Van Marken in his "Puss Moth," and Mr. Temple Harris, who has now joined the R.A.F. On Wednesday Flt. Lt. Comper came down in a "Puss Moth" and collected a "Swift" which had been left behind a few days before.

## READING AERO CLUB

Quite a selection of aircraft have visited the aerodrome during the week—a Percival "Gull" (Napier), the Blackburn "Segrave" and the de Havilland "Dragon"; the latter machine made several flights with full load and demonstrated its ability to climb easily on one engine. Phillips & Powis have sold one of these machines to a prominent Midland private owner.

The annual general meeting of the Club was held on Sunday, February 26, when Messrs. W. A. Smallcombe and C. A. Nepean Bishop were re-elected Hon. Secretary and Hon. Treasurer respectively. Mr. W. L. James was elected Assistant Hon. Treasurer and the Committee are: Messrs. Sims, Bishop, Reading, Pleydell-Bouverie, and Swann. In his speech the Chairman, Mr. G. R. Sims, stated that the number of hours flown by the Club and School machines in 1932 totalled 1,654, 34 "A" licences were granted and one "B" licence. The membership had increased by 30 per cent. and a very hearty vote of thanks was due to Messrs. Lawn and Croxford, the instructors.

## SURREY AERO CLUB

The Committee proposes to arrange a buffet supper dance on Saturday, March 18, at 8 p.m. Tickets will be 3s. 6d. single and 6s. double. A card room will be available for those not wishing to dance.

## MAIDSTONE AERO CLUB

Flying has shown great activity during the past week, and a great number of Kent ladies seem to be learning to fly. On Friday, March 3, the Club held their Spring Dance, which was very well attended, and on Sunday, March 12, the monthly "At Home" will be held.

## LEICESTERSHIRE AERO CLUB

The Leicestershire Aero Club held a dance on Friday, March 3, at the Palais-de-Danse, Leicester, some 500

**BY THE ARUN: Miss Nancy Birkett, secretary, and Mr. C. L. Pashley, instructor, both of the Southern Aero Club, standing before their club-house. The season for flying has evidently started, for last Sunday there were some fifteen machines on the aerodrome at one time. The club is small but very much alive.** (FLIGHT *Photo.*)

**IN THE SUN: Outside the club-house of the South Downs Aero Club, where it is more often fine than not. (L. to R.) Sir Alan Cobham; Miss "Paddy" Maundrell; Sqd. Ldr. W. Helmore; Miss Dodo Watts (looking warmer than when she was recently thrown into an icy pond in the cause of art); Messrs. R. Montgomery and H. Willis, who had both just flown down from Rollason's place at Croydon; Mr. T. Nash, instructor-in-charge at Ford; Mr. R. T. Boyd, a director of Rollason Aviation Co., Ltd. (standing behind).** (FLIGHT *Photo.*)

members and friends attending. An illuminated model of a "Puss Moth" was suspended in the centre of the ball-room, and at midnight Ronald Frankau gave a recital of his most popular songs. Mr. W. Lindsay Everard, M.P. for Melton and President of the Club, brought a large party, which included the Director of Civil Aviation, Lt. Col. F. C. Shelmerdine, and Mrs. Shelmerdine, Miss Delia Crossley, Miss Islay Balfour, Fraulein Margaret Von Treskow and Fraulein Winklester. Miss Jean Forbes Robertson was also present and Miss Kathleen Trifitt with her fiancée Mr. R. H. S. Brown, one of the Club secretaries. Owing to the unfortunate weather Capt. A. M. Diamant was the only visitor by air, though Sqd. Ldr. D. Carnegie motored all the way from Plymouth.

On February 4, Capt. Broad demonstrated the de Havilland "Dragon" at Ratcliffe in the morning and at Desford in the afternoon; a number of members made passenger flights and apparently found the machine very pleasing, in spite of the weather conditions being far from ideal.

On Sunday, February 12, Capt. Marc Diamant made a trip in a Blackburn "Segrave," and on the same day the Club's three machines visited Sywell for lunch on the occasion of the reopening of the Northamptonshire Aero Club. On Sunday, March 5, the Director of Civil Aviation visited the aerodrome and remained to tea.

Two lectures have been given lately, one on February 9 by Mr. P. W. Woodriffe, R.N., the subject being "The Battle of Jutland," and the other on February 23 by the Chief Instructor on "Flying in the Middle East."

## NORTHAMPTONSHIRE AERO CLUB

Owing to an improvement in the weather the Club has been quite busy, and although much of the countryside is under water the aerodrome is clear. Mr. Hamilton, the Club Secretary, did a successful first solo and is only awaiting improved conditions to get in some more flying. On Sunday, March 12, members will inspect the de Havilland "Dragon" which will visit Sywell during the afternoon. As the last dance was so popular it has been decided to repeat it every month. The annual pageant will be held on Whit-Monday followed by a dinner and dance in Northampton.

## ACTIVITY AT FORD

Since the South Downs Aero Club has been taken over by the Rollason Aviation Co., Ltd., and Mr. T. Nash has been appointed as instructor in charge, things in general seem to have taken on a new lease of life at Ford.

During a recent visit we found three School "Moths" all busy and also several visitors who had flown down from Croydon. The clubhouse has been most tastefully decorated and has a unique glass-fronted lounge which makes it a most pleasant place, particularly as Ford Aerodrome seems to get far more than its fair share of fine weather and sun.

The hangars, being large war-time ones, are admirably suited for the repair and overhaul of aircraft, and a great deal of work is being done there. Many aircraft which will later be used in the British Hospitals Air Pageants Display, touring the country this summer, are being overhauled there preparatory to their hard season's work. This display promises to have many original features and will be preceded on the tour by Mrs. Victor Bruce in a Fairey "Fox" and Mr. J. B. Pugh in a Blackburn "Lincock." Mr. C. W. A. Scott will be in general charge of the flying.

It was a South Downs Aero Club machine which enabled us to obtain the photographs shown in this issue of Sir Alan Cobham's activities, as Mr. Nash very kindly let us make use of one of their "Moths" when it was momentarily not required by the Club's members.

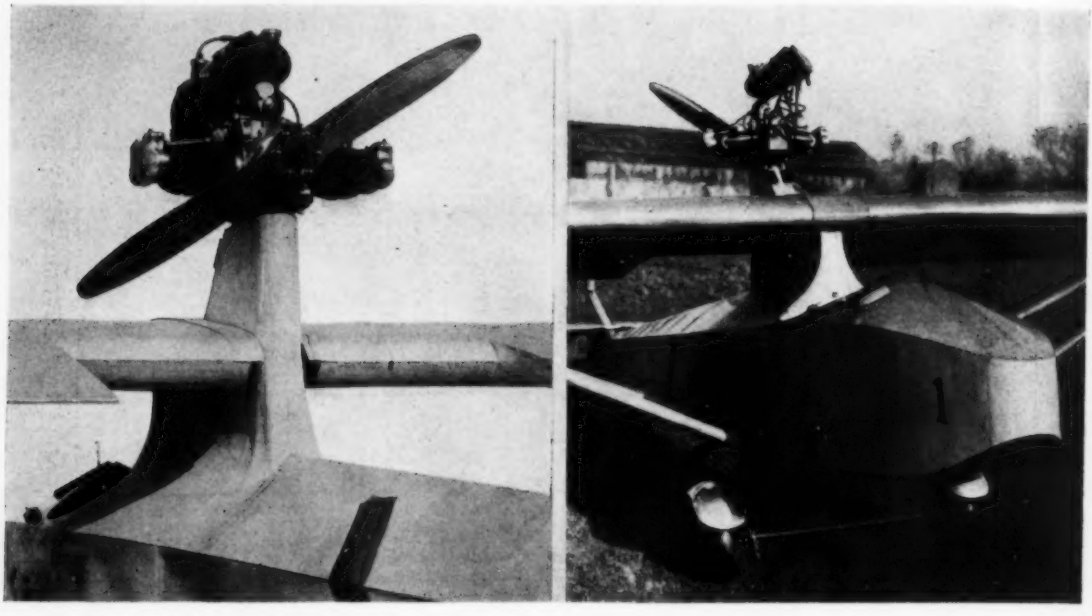
## THE AIRCRAFT CLUB, HARROGATE

Through the kindness of Lord de L'Isle and Dudley, the shooting tenant, and Capt. Fawcett, the Club has been granted permission to use the hills on the Ingleby Manor Estate for gliding and soaring. Members must exercise great care when on the property, they must not enter coverts or stray over the moorland, and especial care should be taken during the nesting season and in August. At present there is no hangar accommodation at the top of the hill, and only thoroughly weatherproof trailers should be left there overnight.

A letter complaining of low flying has been received from Lord Mowbray of Stourton, who lives at Allerton Park, which lies along the east side of the Great North Road between Wetherby and Boroughbridge. Lord Mowbray, in a letter, complains that not only do low-flying aircraft create a great nuisance but endanger themselves owing to the existence of high-tension wires. It is hoped that in future pilots will be more careful, especially over this area.

## SCARBOROUGH AERO CLUB

The Scarborough Aero Club held their first annual dinner on Saturday, February 25, at the Grand Hotel, Scarborough; owing to the exceptionally severe weather, and to half Yorkshire being snowbound, Maj. J. E. D. Shaw and the Rt. Hon. Lord Grimthorpe, the President and Vice-President, were unable to attend. Mr. William Courtenay, who was invited to propose the health of the



**WHERE IT OUGHT TO BE: The B.A.C. "Drone" has its engine mounted as a pusher so the pilot is not hampered by having the slip stream blown into his face. This is the latest B.A.C. model with the engine very much lower than it has hitherto been placed. It is obvious that the pilot will have a very clear view forward.**

Club, only managed to get through by using the train. The Mayor of Scarborough was represented by the Deputy Mayor, Alderman Butler, and others present included Mr. F. P. Morgan, Councillor R. P. Robinson, Sir Joseph Hewitt, Mr. Charles Wastall and Flt. Lts. Riley and Tyson.

In proposing the health of the Club, Mr. Courtenay urged the Scarborough Town Council to realise the importance and necessity of an aerodrome to a progressive resort such as Scarborough. Alderman Butler, in proposing the health of the Mayor and Corporation, drew attention to the fact that the aerodrome was 8 miles from the town, and therefore the Council were doubtful about its utility. Other speakers stressed the fact that very few municipal aerodromes were within 8 miles of the town's centre. A committee meeting was held next morning when Mr. Courtenay was invited to suggest ideas for an air display in August.

## THE B.A.C. "DRONE"

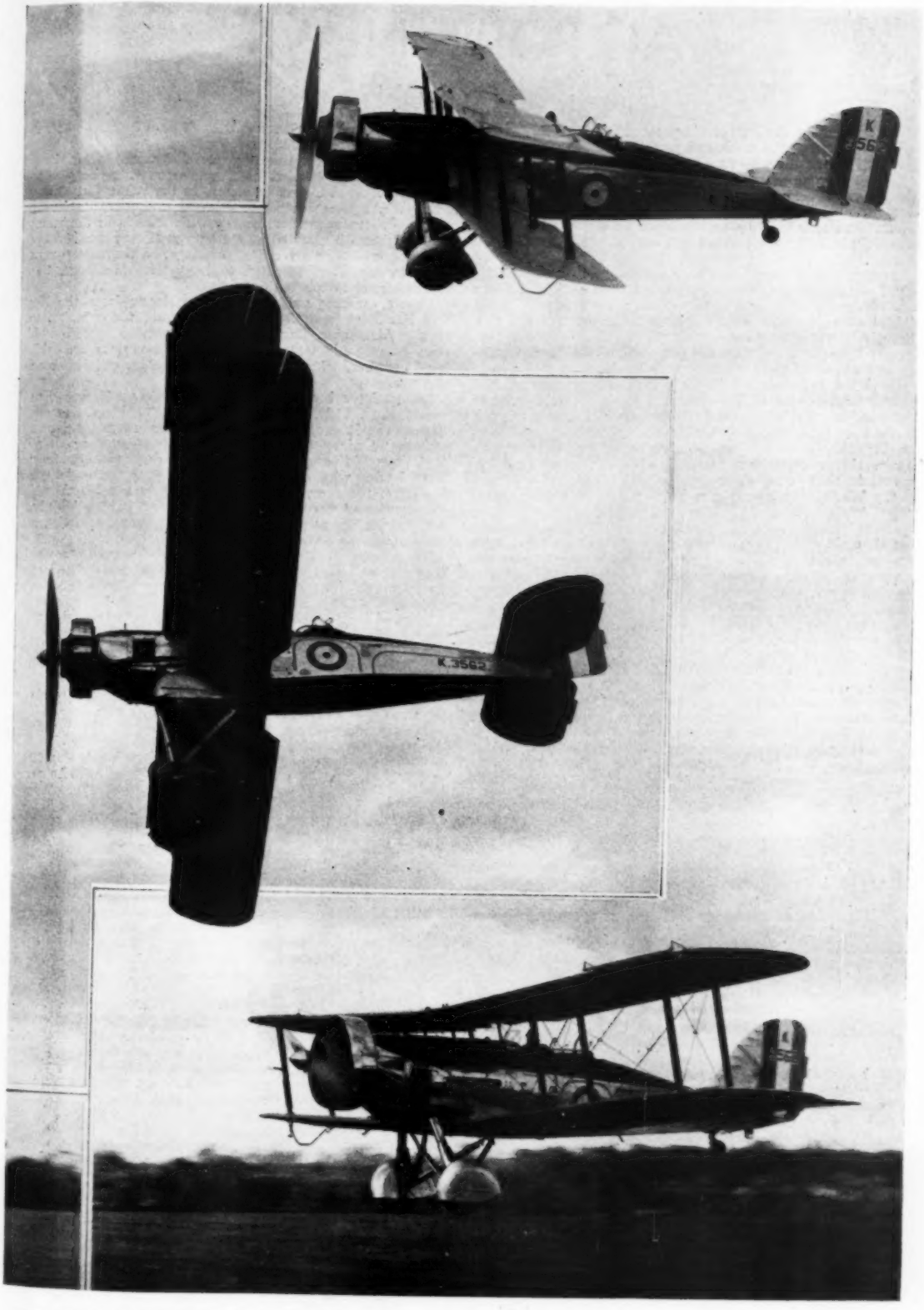
Mr. Lowe Wylde's latest production, developed from his powered edition of the B.A.C. VII, may be seen in our illustrations this week and is called the B.A.C. "Drone." It should be noticed that the engine, instead of being mounted on a pyramid form of steel tube mounting above the wing, has now been lowered considerably and is attached to a wooden neck built up from the fuselage above the position of what was hitherto the rear cockpit. A cut-out in the trailing edge of the main plane provides clearance for the propeller and thus has the added advantage of protecting it from the attention of small boys, and also of preventing the same small boys from walking into it. The "Drone" was tested a few days ago by Mr. Lowe Wylde, and one of the first marked improvements which he found was the absence of any difference in the effectiveness of the tail controls whether the engine was on or off. Both the take-off and the climb are definitely better, but a slight modification is being made to eliminate the increased airscrew noise, which is presumably caused by the neck on the fuselage blanking a considerable portion of the airscrew. Probably if a greater clearance is allowed at this point, and the shape of the fairing altered, no further trouble will be experienced. The "Drone" is fitted with the 600 c.c. Douglas motor-cycle engine, exactly the same as the other machines, and may be taken as the first production model.

## SURREY AERO CLUB

During the past two weeks Club activity at Gatwick has increased considerably, and they are looking forward to an increased flying programme for the year. A drive for new members has met with a good deal of success, and another Buffet Supper Dance will be held on March 18, commencing at 8 p.m. A Clay Pigeon Shoot is arranged for the coming Saturday (March 11), and many International Shots will be in attendance. A Novices event will be held, and this will give those members who have not as yet shot at Clay Targets an opportunity to try this fascinating sport. Shooting will continue throughout the day, and the prizes will be presented in the Clubhouse. New flying pupils have joined the School, and premium pupils are going ahead for their "B" licences. Miss D. Reynolds has purchased one of the School machines, and a new "Redwing" will be brought into the School. News will shortly be forthcoming about the new type "Redwing," and it should not be very long before it is at Gatwick.

## SKEGNESS AND EAST LINCOLNSHIRE AERO CLUB

Snow and bad weather generally have reduced the flying time during the last month at Skegness, but in spite of this the Club "Moths" have flown approximately 60 hr. Various taxi trips in both the "Puss Moth" and the "Fox Moth" have been carried out, which have included trips to Birmingham twice, Bristol, Slough, Hull twice, Leicester, Nottingham, and three times to London and back. For the information of visiting pilots, there is now a concrete circle on the aerodrome with arrows marking the direction of circuit. Mr. W. Shaw has completed the 100 hr. flying for his "B" licence, and is shortly undertaking the necessary tests. It is proposed to run a regular service from Birmingham via Nottingham and Leicester to Skegness during the summer months, and the possibilities of this service will be tried out for one week at Easter with a "Fox Moth."




THE FIRST PRODUCTION "WALLACE": Some time ago the Westland Aircraft Works received an order for "Wallace" machines (Bristol "Pegasus" engine), the first of which is shown during tests by Mr. Penrose. (FLIGHT *Photos.*)

# AIRPORT NEWS

## CROYDON

AMONG the most important passengers to fly during the week-end was the Duke of Northumberland, who flew by Air Union to Paris.

The first annual dinner of the Airport held at the Greyhound Hotel, Croydon, on Monday, February 27, was acclaimed by all who attended an outstanding success. There were nearly 400 people seated at the dinner, which was followed by a round of gaiety and amusement until 2 a.m.

Surrey Flying Services, who have taken over the Municipal aerodrome at Plymouth, started their activities there on Wednesday, March 1, when they sent two of their "Moth" aeroplanes from Croydon to inaugurate the new branch of their business under the terms of their agreement with the Plymouth municipality. One of the principal features of their business will be the school of flying.

A prominent member of the technical staff and a chief inspector from the engine shops of the K.L.M. flew from Amsterdam to Croydon on Wednesday. Later they embarked on a ship bound for U.S.A., where they will visit the workshops of all the leading aero engine manufacturers, in order to keep abreast with the latest developments in that country.

On Wednesday morning a large party of employees of the London office of J. W. Jagger & Co., and friends, gathered together in one of the spare offices in the main building of the Airport, where they held an impromptu farewell party in honour of the London manager, who was returning to Capetown on the African air mail service, having spent a number of years in this country. Jaggers have just celebrated their jubilee in South Africa, and with 50 years' experience behind them are well able to judge the enormous advantages which were open to them with the advent of commercial aviation in that country as a means of quick communication and transport. Mr. Nunnerley, one of the managing directors, constantly uses the Union Airways services when visiting branches of the firm, and whenever practicable the company's correspondence is always despatched by air mail.

Herr von Harbow, the famous German film writer, arrived by D.L.H. on Thursday from Berlin. It is interesting to note that twice the number of passengers travelled from Croydon by D.L.H. during this February than in February, 1932.

Mr. Victor Smith, the 19-year-old South African airman who left Oran at 10 a.m. on Thursday morning on a return flight to England, was expected to arrive at Croydon on Friday. As the weather was very unfavourable and he had made arrangements to stay with friends in Southampton, Mr. Smith decided not to proceed any further than Lympne, where he arrived at 3 p.m. Mr. Smith expects to start on his third attempt to beat Mrs. Mollison's Cape record about March 9.

People arriving and returning on leave from the Near and Far East have found enormous advantage in the use of the Air Union London-Marseilles service as a valuable time saver. Air Union had eleven passengers on Friday for Marseilles, where they embarked on an outward-bound steamer.

Orders have been pouring into the Cirrus-Hermes Engineering Co., Ltd., for more "Hermes" engines. In addition to the 65 ordered last week further orders for approximately 20 more "Hermes IV" and a large number of "Hermes II" engines were received during the week. A lorry loaded with engines was just leaving the works when I visited them on Friday. These, I was told, were for home use, as were another four engines which had been ordered for a new type of aircraft that is expected to make its appearance on the market shortly.

Thousands of people in over two hundred towns in England will shortly have an opportunity of flying in the first British light aeroplane which flew across the North Pole with the British Arctic Air Route Expedition in 1929. The machine, which is a "Gypsy Moth," has been purchased by Mr. W. C. A. Kingham, a former director of Gravesend Aviation, Ltd., and will be one of the large fleet of aeroplanes which will be used by the British Hospitals Air Pageant Tours, starting in April.

The second "Monospar" ordered by the Maharajah of Jodhpur was despatched to India during the week. The first was shipped on the same steamer as the Westland planes of the Mount Everest Air Expedition.

The total number of passengers for the week was 999; freight, 53 tons 19 cwt. HORATIUS.

## FROM HESTON

ON Monday, February 27, one of the Airwork machines was chartered by Gaumont Films to obtain photographs of the flooded areas in the neighbourhood of Arundel and Pullborough. Two Hawker "Horsleys" of the Danish Air Force cleared Customs for Denmark, one piloted by Flt. Lt. Bulman and the other by Capt. T. J. Prip, of the Danish Air Force.

Tuesday was a good flying day and two new pupils joined the school. Capt. Birkett, of Birkett Air Services, and Mr. Bailey, of Air Taxis, Ltd., cleared Customs, both in "Puss Moths," for Monteburg, to pick up films from the Atlantic liner arriving at Cherbourg, while a "Puss Moth" of the British Air Navigation Co. left for Berck.

Wednesday was busy for the school machines. Miss James had a final lesson with Capt. Baker before leaving for Kenya.

On Thursday the airport received an informal visit from the Mayor and Corporation of Southampton, who spent the greater part of the day inspecting the equipment and organisation at Heston.

On Saturday Lt. McGregor, of the Royal Artillery, cleared Customs for Paris in a "Cirrus Moth" *en route* for India, where he will rejoin his unit at Lucknow, after leave in England. The Birkett Air Services took a machine to Barmouth in Wales, where a landslide had caused an accident on the railway early in the forenoon. Mr. Geoffrey Ambler's new "Monospar" G-ACCO was delivered from Croydon, and the school machines were kept busy until late in the evening by enthusiasts who took advantage of the improved conditions for flying. Mr. W. Rhodes-Moorhouse, flying a "Moth," was welcome after a long absence from Heston, having been abroad for some time, engaged in a shooting trip in the Rockies; following this he went to Cape Town and finished his tramp abroad by a trek to Cairo.

Sunday was a good day for flying. A "Puss Moth" of the British Air Navigation Co. cleared Customs for Zürich with two passengers. News came through during the week that Mr. Nigel Norman has arrived in Bulawayo and that Capt. Neville Stack arrived in Cairo on March 1, piloting the Spartan "Cruiser" YI-AAA, with a crew of three and one passenger, on his way to Iraq.

It is worthy of the notice of private owners that Airwork, Ltd., have recently completed arrangements whereby they have been appointed the sole authorised repair agents in the South of England for the products of A. V. Roe & Co., Ltd. A comprehensive stock of spare parts will be held at Heston and owners of Avro machines who have any difficulties are invited to communicate with the Airwork Service Dept.

## Aerodrome for Colombo

IT is understood that the Government of Ceylon is examining the possibility of establishing an aerodrome in the vicinity of Colombo. The scheme was mooted three years ago but was shelved. It is pointed out that in addition to the strategic advantages of a properly-equipped aerodrome in Colombo, it should be possible to establish air mail link between Colombo and Madras, which would reduce the time taken for a letter to reach London to about 8½ days.

# AIRISMS FROM THE FOUR WINDS

## Heston's Helicopter

HERREN NAGLER and HOFFNER hope to make tests with their Helicopter at Heston any day now. It is only held up for an end bearing for one of the blades. This has been ordered from Germany and is expected daily. Speculation is rife at Heston as to the success of the invention, but we understand that it has been checked over by at least two aerodynamical experts in this country whose verdict was that "it ought to work." The two inventors claim to have flown a prototype many times, and they must, therefore, have gained some knowledge of the adequacy of the strength of their structure We hope so, at any rate, and wish them every success.

## Autogirations

VISITORS to Hanworth will often see the new "Autogiro" without a fixed wing, and the other afternoon this same machine was being flown with the rudder disconnected. Mr. Cierva was there himself with some of his experts, and he looked delighted with the result of the trials. We noticed that a new form of control to tilt the rotor was also being tried. The more conventional method previously used on this machine was always understood to be somewhat heavy, so it is not surprising that a change has been made. After all, the reverse of normal, *i.e.*, the "hanging stick," has been used with success in the French LeO machine, and we hear that this system is also being used in the single-seater which is now awaiting the new 40-h.p. Douglas engine, before doing its trials. The five-seater cabin "Autogiro," ordered by the Air Ministry, should, if what we hear is true, have an amazing performance, so perhaps the idea of landing in, and taking off from, the Horse Guards' Parade, is not quite so silly as it used to seem.

## Houston Mount Everest Expedition

THE members of the Houston Everest Expedition arrived at Amman in Transjordan on the afternoon of March 1, on March 2 they left for Rutbah Wells, where they were delayed on account of violent sandstorms. They eventually reached Baghdad early in the morning of March 3, where they were again delayed owing to permission to fly through Persia not having arrived, though it was asked for in London five weeks ago. During their stay in Baghdad the members of the Expedition were the guests of Sir Francis Humphrys, the British Ambassador in Baghdad. On Sunday, March 5, the Expedition reached Bushire after a very troublesome journey from Baghdad; owing to sandstorms the visibility was less than 200 yards, and so the machines turned back; Air Com. Fellowes lost the others, but eventually reached Basra. Meanwhile Lord Clydesdale and Flt. Lt. MacIntyre, after having landed near the railway, eventually went to Ur, where they spent the night in a rest house. On March 6 the Expedition reached Gwadar, on the coast of Baluchistan, having called at Bandar Abbas.

## Prince Ali Khan's Flight in Asia

PRINCE ALI KHAN, son of His Highness the Aga Khan, recently flew over India, Burma and the Federated Malay States in a "Puss Moth," piloted by Maj. Vetch, member of the Bombay Flying Club. From Rangoon to Penang (1,100 miles) the journey was frought with great risks. For miles together there was nothing but thick jungles, mountains and sea. The next stage of the journey was from Penang to Singapore. In all about 9,000 miles were covered before Bombay was reached. The Prince is emphatic in his opinion that the best way to see the Taj Mahal at Agra, the Pagodas at Rangoon, the view presented by the mighty Ganges and the wild country in Burma is to fly over them.

## Aircraft in the Eastern War

THE Shanghai correspondent of the *Observer* states that the unexpected rapidity with which the Japanese captured the city of Jehol was due to their aircraft. Up to the capture of Pingchuan the Japanese had a comparatively easy task, but after that the Chinese held a very strong position in the mountains from which nothing but attack from the air could have dislodged them. The Japanese aircraft made such an attack and the Chinese had no aircraft with which to put up any resistance. Hence, according to this correspondent, their hurried evacuation of the position and the fall of Jehol town.

## Cairo—Rhodesia Flight

FIVE "Gordons" of No. 6 (Bomber) Squadron stationed at Ismailia are to undertake a Service flight from Cairo to the Rhodesia and Nyasaland at the end of March. Flt. Lt. F. R. D. Swain will be in command, while the A.O.C., Middle East, will be represented by Group Capt. C. W. H. Pulford, O.B.E., A.F.C., who commanded the first Cairo-Cape Town R.A.F. flight in 1926. The other officers will be F/Os. D. J. Alvey, K. P. Lewis, S. P. Richards and J. S. Sabine. Six airmen will also take part in the flight.

## Artillery Battery Transported by Air

DURING the U.S.A. naval manœuvres a complete battery of artillery was transported 25 miles in two large bombing machines. The operation took half an hour, at the end of which time the guns were in action against the enemy.

## An Aerial Signpost

THE Frome Gasworks, in Somerset, have painted the word "Frome" in large white letters on the top of a new gasometer at the works, which serves as a useful sign to airmen as well as being an excellent advertisement.

**WHY BOTHER ABOUT HELICOPTERS?: A Hawker "Demon," piloted by Flt. Lt. Bulman, doing a bit of climbing. In our article on No. 23 (Fighter) Squadron last week, the performance figures given related to the results obtained when flying in formation. Fitted with the Rolls-Royce supercharged "Kestrel," a single machine will do approximately 190 m.p.h. and cruises at 160 m.p.h.** (FLIGHT *Photo.*)

# JUST PRESS THE BUTTON

WE have often wondered how much longer British manufacturers were going to be content to offer their civil aircraft with "swinging the prop" as the only means of starting up the engine. Attempts have been made to use Service methods, like the ordinary hand-starter magneto, but that never seems to have caught on, presumably because it entailed turning the airscrew. Then certain engines have had hand-turning gear fitted, but it entails a lot of hard work, and again seems more suitable for Service use. Large aircraft like the Short "Scipio's" or H.P.42's use the Bristol Gas starter, but this can hardly be fitted in medium-sized or small aircraft on account of its weight alone. Others have considered the use of foreign systems like the Viet compressed-air or the Farman cartridge type. The Avro "Mailplane," built for use in Canada, had an Eclipse Electric Inertia Starter of the type widely used on the American Continent.

The only really successful, simple engine starter commonly used on our smaller civil aircraft is that devised by Mr. D. R. Pobjoy, and fitted to all his engines. This is a simple hand ratchet which turns the engine over quite easily and on, for example, the "Monospar" it is so arranged that a direct pull on a toggle can easily be made by the pilot when in his seat.

Even this system, however, entails a certain amount of physical effort, and it is good news to learn that we are to have a system which promises to be as simple as that fitted to motor-cars.

For some months past we have, in confidence, watched the growth and development of the Cirrus-Hermes Inertia Starter. It is only now, however, that the manufacturers have felt sufficiently satisfied with their efforts to permit anything to be said about them.

Mr. A. H. Caple, the firm's Chief Designer—the man responsible for that very successful engine, the "Hermes IV"—originally conceived the starter, and he is now being helped by one of the newest directors of the firm, Mr. C. S. Napier.

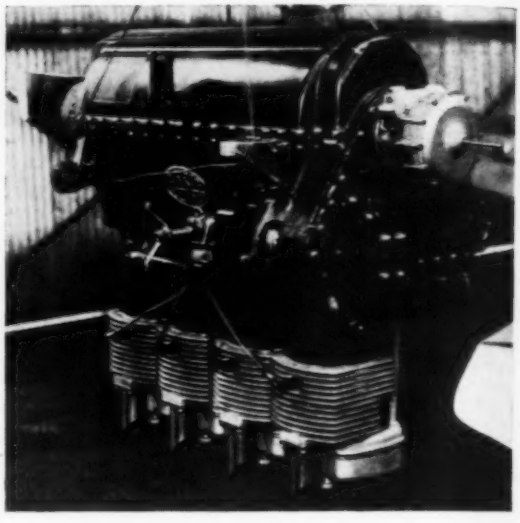
Being an inertia starter, it naturally consists, in its essentials, of a flywheel geared to a dog clutch in such a way that the inertia force of the wheel can be used to turn the engine over several compressions. Actually, with the electric model, a hot "Hermes IV" can be turned over six times after the electric drive has been running up the flywheel for 15 sec. The starter will ultimately be marketed in both hand and electric forms. It is on the latter, however, that the designers are concentrating most at the moment. The former is already quite successful, but it is felt that with a growing number of aircraft being completely equipped with electric generators and batteries, the "press the button" method is most likely to be demanded.

The unit is quite small, being approximately 7 in. long by 5 in. diameter, and at present, for the electric model, weighs only 17 lb. The hand-driven type is even lighter at 10 lb.

A normal type of motor armature is wound on the shaft which carries the flywheel, the latter weighing only about 2 lb., and then a train of gearing on the sun and planet principle leads the drive through a spring-loaded clutch to the sliding dog clutch. This dog clutch is on a splined shaft and when pushed home by hand it engages with its mate on the end of the engine shaft.

The spring-loaded friction clutch is set to slip at a torque of about 250 ft./lb., thus providing a safety device against a backfire.

The flywheel speed under normal use is about 16,000 r.p.m., which, through the 200 to 1 gearing, gives the dog clutch an engine turning rate of 80 r.p.m. This flywheel speed is obtained after some ½ min. of "pressing the button," and is more than sufficient to start a stone-cold engine. Only ¼ min. running up is, however, adequate for a hot engine. The electric motor is so wound that the acceleration to these 16,000 r.p.m. is rapid, but the peak r.p.m. are not reached for some appreciable time afterwards. This means that the acceleration curve is flat-topped, giving the user the advantage of a quicker start than would be the case with a more uniform "straight line" type of curve.



**SIMPLIFYING STARTING: A view of the new Hermes starter fixed to the rear cover plate of a "Hermes IV" engine. This view brings out its small and compact nature. This is the hand-driven model which only weighs 10 lb.** (FLIGHT *Photo.*)

The hand-operated type is similar to the electric, except that the flywheel is spun up by a handle through worm gearing. This is very easy to operate and is a one-hand job.

Both starters have been designed so that they could be fitted to the more common light aircraft engines in use in this country, and it is not the intention of the firm that their use shall be confined to starting engines emanating from their Croydon factory. We may therefore hope to see the Hermes starter bolted to the back cover plate of most of our in-line engines before long.

## "Monospar" Activity

GENERAL AIRCRAFT, LTD., are being kept busy fulfilling orders for the "Monospar" ST.4 monoplane—which has already been fully described in FLIGHT. As previously announced, one of these machines was sent out recently to the Maharaja of Jodhpur, while a second one is about to be shipped to the Jodhpur Flying Club—who have been appointed agents for the "Monospar" in India. Other recent orders for this machine include one to Western Air Transport, Ltd., Oranmore Aerodrome, Co. Galway (already delivered); one to the Swiss "Alpar Berne" Company (in operation); one to Highland Airways, Ltd. (in formation), which company will operate a passenger, mail and newspaper service between Inverness and the Orkney Islands; one private order to Mr. Geoffrey Ambler; one to the Hon. Ernest Guinness (per Brian Lewis); and one to Robert Germaine, who is agent for the "Monospar" in Morocco, Tripoli and Tunisia. The C. of A. gross weight of the ST.4 has now been approved at 2,550 lb., which leaves a disposable load of 1,130 lb., the tare weight being 1,420 lb.

## Hawker Aircraft for Denmark

THE Danish Government have ordered a number of "Nimrod" single-seater fighters, fitted with Rolls-Royce "Kestrel" engines, from the Hawker Engineering Co.

## American Naval Manœuvres

RECENT manœuvres of the U.S.A. fleet in the Pacific have made great use of aircraft carriers. The Black fleet consisted of the carriers *Saratoga* and *Lexington* and a force of cruisers. The Blue fleet had to defend the coast against the Black raids. The *Saratoga* contrived to evade the defence, and her machines bombed San Francisco and San Pedro. The attack was met energetically by Blue aircraft. The *Lexington* was less fortunate, and was theoretically torpedoed and afterwards shot to pieces by the battleship *Oklahoma*.

# BOOK REVIEWS

*"Britain's Air Peril: The Danger of Neglect, together with Considerations on the Role of an Air Force." By Maj. C. C. Turner, A.F.R.Ae.S. (Sir Isaac Pitman & Sons, Ltd.). Obtainable from* FLIGHT *Office. Price 5s. 6d., post free.*

MAJ. TURNER is a very eminent writer on aeronautical subjects, and everything which comes from his pen deserves and is sure to receive very careful consideration. In the various discussions about disarmament in the air Maj. Turner has seen, and rightly seen, a menace to the security of Great Britain. In publishing a book on this subject at this juncture he has rendered a public service for which he deserves the thanks and congratulations of all.

In his Preface Maj. Turner writes: "I believe that any complicated measure relating merely to material for war may prove a pitfall." That is a very wise remark. Mr. Baldwin recently said that it was not disarmament which would prevent war, but the will to peace, which is substantially the same thing as what Maj. Turner has written. The latter also shrewdly remarks that the chief motive for all the present talk about disarmament is economic. "The cost is the real bugbear." It must follow that in such circumstances it would be folly to scrap our insurance policies in order to economise on the premia. In fact, all this part of the book, in which Maj. Turner sticks to the text of his main title, could hardly be better.

Unfortunately, the secondary title provides the text with which the major part of the book is concerned. In the disarmament talks Maj. Turner has discerned "the handiwork of reactionaries of the older Services who have for years jealously striven against that true conception upon which was founded the creation by Great Britain of the separate Department for Air Matters, civil and military." Later on he writes: "This book is an attempt to define the functions of an Air Force in war." The high expectations aroused by the fine main title are largely disappointed, and the book in the main descends to the level of a partisan pamphlet which takes the extreme air view as against the two older fighting Services.

If it is the case that the Admiralty and the War Office are working with the deliberate intention of abolishing the Air Ministry and the Royal Air Force, we hold most strongly that such attempts must be resisted tooth and nail. Such a retrograde step would, we are firmly convinced, be a threat to the security of the British Isles and the British Empire. At the same time we do not believe that the best interests of, first, our national security, and, secondly, of flying itself, are served by taking what may be called the extreme air view. We can contemplate without dismay considerable modification in the control of civil flying by the Air Ministry. *If* the cause of national defence could be best served by handing over the Fleet Air Arm, bag and baggage, to the Admiralty, we should not expect the ruins of the British Empire to come tumbling about our ears. Maj. Turner, apparently, would expect some such catastrophe. On page 60 he mentions his strong insistence on the integrity of the Air Force and its complete independence, with which FLIGHT cordially agrees, though he admits that it must always be one of a team of three. He goes further than this, however. On page 130 he writes: "The Air Estimates ought to be at least as high as those of the Navy, and one day, most certainly, they will exceed them." On page 66 he very strongly suggests that aircraft carriers ought to be taken away from the Admiralty and handed over to the Air Ministry.

Some of these views are those of an air extremist, and we cannot support them all, however great might be our private delight if the Air Estimates ever did exceed the present scale of Navy Estimates. We consider that extravagant claims on behalf of the air do poor service to the Air Ministry and the Royal Air Force.

After that, it would be surprising if Maj. Turner did not express extreme ideas as to the efficacy of air attack. He wastes no time at all in getting to work on that line. On page 1 he says: "On the outbreak of a first-class war with a Continental Power the Government would *undoubtedly* be transferred to a northern city." The italics are ours. He repeatedly insists that air power can strike a decisive blow which can end a war. When Maj. Turner writes about war in general, his line of argument is not easy to follow. What his arguments and his quotations from other writers appear to us to prove is that an army can win a war and that an air force cannot do so.

In fact, all through the book there are numerous statements with which friends of the best interests of the Royal Air Force will be bound to disagree, but notwithstanding the book is one which everybody should read and study for himself.

*"The Book of the Standard Nine." By John Speedwell. (Sir Isaac Pitman & Sons, Ltd., 1932.) Obtainable from* FLIGHT *Office. 3s. post free.*

UNDOUBTEDLY a fair proportion of our readers have Standard Nines. Their money would not be wasted by the purchase of this book. It is perhaps a pity that where space has been afforded to domestic matters of the standard makers, none is given to a schedule of code words for spare-part orders—whereby the car-pocket value of the book might have been enhanced.

*"Simplified Aerial Navigation." By J. A. McMullen, M.B.E. (Charles Griffin & Co., Ltd., 42, Drury Lane, W.C.2.) Obtainable from* FLIGHT *Office. Price 5s. 4d., post free.*

THIS small volume expresses clearly, with commendable brevity, what is so often badly put in verbal lectures. "Navigation" is, perhaps, a too ambitious title, for the book deals only with air pilotage by dead reckoning, and the elementary facts about compasses, their idiosyncrasies and their adjustments for ordinary deviation. The subject of single-seater air pilotage is both adequately and clearly discussed, but it is debatable whether there is not too much insistence on drift finding for ordinary flying. The practical difficulties of flying level laterally are very great, and it is exceedingly difficult for an amateur solo pilot to observe his trim accurately and at the same time closely to check his drift. Mr. McMullen has provided an appendix wherein he explains Northerly Turning and kindred compass errors, but thereafter it may well be said that he falls short of the mark, for, undoubtedly, if the subject of compass errors is to be analysed at all, it should be done both accurately and completely. For example, it should have been emphasised that the tilt of a magnetic system in a compass in a turn is not dependent on (or even directly related to) the bank of the aircraft. A pendulous compass has its centre of gravity displaced from its axis (towards south in the Northern Hemisphere) just as much as a "weight-balanced type." The error on south is equal to that on north, but being helpful is nearly always overlooked, while the pitch and acceleration errors on both east and west are just as easily demonstrated and are, perhaps, even more deceptive than the so-called Northerly Turning error. Taken as a whole, however, the book under review forms a handy primer, and is certainly a practical introduction to the subject.

## Airwork, Ltd., Abroad

THE Anglo-Egyptian air navigation company, Misr Airwork, have decided to increase their capital from £E20,000 to £E75,000 that they may purchase a large passenger machine to operate a regular service between Cairo and Alexandria, Aswan and Suez. At present the company's machines are "Puss Moths."

## The Essex Aviation Display

THE Essex Aviation Display will be held this year on Saturday, September 9, at Maylands Aerodrome, Romford, and will again be organised by Mr. William Courtenay for Hillman's Saloon Coaches & Airways. Mr. Edward Hillman will once more present the Hillman Trophy for an air race which will be held from Romford to his aerodrome at Ramsgate, Clacton and return. The race will be run under the auspices of the Royal Aero Club and the rules of the F.A.I. Further details will be announced later.

## Kent Airport

ROCHESTER City Council are proposing to purchase 100 acres of ground to turn into an aerodrome. It is estimated that the scheme will cost about £30,000, and the Air Ministry have expressed their approval of the scheme.

# CAMBRIDGE UNIVERSITY AIR SQUADRON

VISITORS to the Cambridge University Air Squadron who took the trouble to accept the kind invitation of Wing Com. F. P. Don to a tea party at the Squadron Headquarters, Fen Causeway, as a preliminary to the evening's dinner, on Monday, March 6, not only found an air of hospitality, usually only met in an R.A.F. mess, but saw much of great interest. First, the Air Squadron possesses a delightful mess from the roof of which are hung various propellers and models of aircraft, which aroused the envy of the Wing Commander in charge of the Oxford University Air Squadron. After tea a film was shown depicting various matters of aeronautical interest. First an exhibition of how not to land a flying boat on a fairly calm sea ; how easy porpoising develops, and how difficult it is to check. Next came a "Virginia" catapulted into the air, and the groans of envy from certain Service pilots present gave ample proof of the catapult's efficiency. Pictures of an R.A.E. Free Spinning Tunnel were then shown, in which a wooden model was put through the actions of various types of spins, the model being kept in the tunnel by a regulated air current. When this particular film was slowed down, it was possible to see the actual movements of a machine while spinning. The next film was of special interest, for it showed a Boeing N.B.1 seaplane in a horrible flat spin, which the pilot was unable to correct, finishing up with a spectacular crash. Happily the pilot survived, but his efforts to gain control of the machine while spinning earthwards could be clearly seen in the machine's movements. An "Autogiro," and family, then demonstrated the ease with which this type of machine can be landed on a "square foot" of American soil, and, given sufficient wind, actually backwards.

A look-in at the Squadron's workshops disclosed two very interesting exhibits, one a wind tunnel which charts out the pressure, at certain wind speeds, on the surface of a wing or other parts of an aeroplane. The other exhibit is more amusing. A potential pilot seats himself (or herself) in a seat which contains a spade grip joy stick, and a rudder bar, the movements of which, either for a turn, a climb, or a dive, are graphed out on paper showing the error on the part of the pilot, and it is a skilled pilot indeed who can produce a perfect aerial movement graph.

In the evening of the same day a dinner was held at the University Arms Hotel, which was attended by some 200 past and present members of the Air Squadron and their guests. Wing Com. Don, who was in the chair, in proposing the health of the guests, said that it was his pleasant duty to welcome Air Vice-Marshal F. W. Bowhill, C.M.G., D.S.O., who had been good enough to attend. Another gentleman whose name must never be forgotten was Mr. Watkins, the first member of the Cambridge University Air Squadron, who had perished in Arctic regions while working in the interests of scientific research. The Vice-Chancellor, Mr. W. Spens, C.B.E., was also very welcome ; he took a great interest in the work of the Squadron, and his assistance had been, and was, invaluable. Air Force tradition, continued Wing Com. Don, prevented him from making complimentary speeches about brother officers, and he fully realised how modest and reluctant to be praised they were, but he could not sit down without mentioning Air Com. R. P. Mills, Wing Com. Vernon S. Brown and Wing Com. R. C. Spratt, O.B.E., who mended the machines broken by careless pilots. Among other very welcome guests were the Master of Peterhouse, the Master of Downing College and Mr. H. E. Wimperis.

The Vice-Chancellor, in replying, regretted that it was not his duty to propose the Squadron's health. In his opinion, the University Air Squadron was deserving of more support than any other University institution; he well remembered the original proposal to start the Squadron, and the totally unnecessary fear displayed by the Air Ministry. That the Squadron now stood so high in the Universities' approval was due to its excellent reputation and to the succession of capable chief instructors. The University knew that the Air Ministry could be relied upon to send good men. In Cambridge, the Vice-Chancellor continued, they claimed a right to speak with authority on the subject of educational interests, but he could not speak as to how far the Royal Air Force should be allowed. He was, however, quite certain that the public realised the very valuable work done by the Air Force in policing the outposts of our Empire. The saving in money was considerable. The Army in Iraq had cost ten million a year, sinking to eight; the Royal Air Force, doing the same work, cost four million, dwindling to two.

Air Vice-Marshal F. W. Bowhill, in proposing the health of the Squadron, said it was his intention, as usual, to be brief. If we were forced to fight by the incompetency of politicians, then he felt sure the youngsters at the Universities would be the first to offer their services. Turning to the Civil side, it was a well-known fact, he said, that Varsity men were to be found the world throughout, and it was up to members of the University Air Squadron to spread the doctrine of the new art of aviation, its benefit to the Empire and the World. He himself always liked to think that he had youth to back him up if the worst happened.

Mr. J. O. Hinks, in replying, thanked the Air Ministry for their continued support. The change-over from "Brisfits" to "Atlas" was welcome, and they found Netheravon a much more civilised spot than Old Sarum.

Professor Ingles, who objected to being hauled on to his feet, told a story of a journalist, who, in describing a gallant major, mixed up the two expressions "battle scared" and "bottle scarred."

Among others present were Air Vice-Marshal F. W. Bowhill, C.M.G., D.S.O.; the Master of Peterhouse; Field Marshal Sir William R. Birdwood, Bart., G.C.B., G.C.S.I., G.C.M.G., C.I.E., D.S.O., LL.D.; the Vice-Chancellor, Mr. W. Spens, C.B.E.; the Master of Downing College, Professor A. C. Seward, ScD., F.R.S.; the Master of Christ Church, Mr. N. McLean; Wing Com. N. C. Spratt, O.B.E.; the Master of Gonville and Caius College ; Mr. J. F. Cameron; Wing Com. K. R. Park, M.C., D.F.C.

## Lady Bailey

LADY BAILEY has been suffering, at her London home, from an attack of typhoid fever, which is probably a result of her experiences in the Sahara. Her condition was thought at one time to be serious, but later her condition improved.

## Another Balloon Ascent

A REPORT from Warsaw states that Lts. Hynek and Burzwski made a balloon ascent of 31,633 ft. (nearly 6 miles) on Wednesday, March 1.

## The New American Airship

THE new American airship *Macon* is expected shortly to make her first trip into the air. She will be christened next Saturday afternoon, when her crew will allow her to rise a few feet into the air to be "airborn." Soon after this ceremony it is hoped the *Macon* will make her first trial trip, after which she will fly to her base at Sunnyside, California. The *Macon* has eight Maybach engines developing 550 h.p. The following comparisons between the four world's largest airships are interesting:—*Macon* and *Akron :* Length overall, 785 ft.; height overall, 146.5 ft.; gas vol., 6,500,000 cub. ft.; gross lift, 403,000 lb. *Los Angeles :* Length overall, 658.3 ft.; height overall, 104.0 ft.; gas vol., 2,470,000 cub. ft.; gross lift, 153,000 lb. *Graf Zeppelin :* Length overall, 776 ft.; height overall, 132 ft.; gas. vol., 3,700,000 cub. ft.; gross lift, 258,000 lb.

## "Wacos" for Brazil

THE Waco Aircraft Company, of Troy, Ohio, has received an additional order for ten advanced trainers, powered with Wright 240-E "Whirlwind" engines, for the Brazilian Air Service. These aeroplanes will make a total of 20 for this Government during the year 1933, 10 having been shipped on January 7. These will make a total of 69 machines for this Government within a year, the first five Wacos having been shipped on March 19, 1932.

## R.Ae.S. Lecture Postponed

WILL readers please note that Mr. H. M. Garner's lecture on "Seaplane Research," which was to have been delivered before the Royal Aeronautical Society on March 23, has been postponed to April 27.

# THE ROYAL AIR FORCE

*London Gazette, February* 28, 1933.

*General Duties Branch*

Lt.-Com. I. R. Frant, R.N., is reattached to R.A.F. as Flt. Lt. with effect from Feb. 15, and with seny. of Jan. 1, 1931 ; Pilot Officer on probation J. W. Donaldson is confirmed in rank (Feb. 28). The following Pilot Officers are promoted to rank of Flying Officer (Feb. 6) :—T. H. L. Nicholls, J. Ramsden, A. Threapleton.

Pilot Officer F. C. Daubney is promoted to rank of Flying Officer with effect from March 1, and with seny. of Jan. 25, 1933 ; Air Commodore F. K. Haskins, D.S.C., is placed on half-pay list, Scale B, with effect from Jan. 21, and is transferred to Scale A with effect from Feb. 19 ; Air Vice-Marshal A. E. Borton, C.B., C.M.G., D.S.O., A.F.C., is placed on half-pay list, Scale A, with effect from Feb. 1, and is transferred to Scale B with effect from Feb. 20 ; Wing Com. W. Sowrey, D.F.C., A.F.C., is placed on half-pay list, Scale A, from Feb. 17 to Feb. 23 inclusive ; Wing Com. J. W. Woodhouse, D.S.O., M.C., is placed on half-pay list, Scale A, from Feb. 18 to Feb. 23 inclusive ; Flying Officer W. W. Stainthorpe is placed on half-pay list, Scale B, from Feb. 19 to Feb. 27 inclusive ; Lt. J. P. G. Bryant, R.N., Flying Officer, R.A.F., ceases to be attached to R.A.F. on return to Naval duty (Jan. 2) ; Lt. H. H. Caddy, R.N., Flying Officer, R.A.F., ceases to be attached to R.A.F. on return to Naval duty (Jan. 18).

*Medical Branch*

Flt. Lt. M. T. O'Reilly, M.B., B.Ch., is granted a permanent commn. in this rank (March 1) ; Wing Com. P. M. Keane, L.R.C.P. and S., D.P.H., is placed on retired list (Feb. 28).

### ROYAL AIR FORCE RESERVE
### RESERVE OF AIR FORCE OFFICERS

*General Duties Branch*

C. P. Aron is granted a commn. in Class AA (i) as Pilot Officer on probation (March 1) ; R. H. Soundy is granted a commn. in Class C as a Flying Officer (March 1) ; Flt. Lt. E. H. D. Spence (Lt.-Com. R.N., retd.) is promoted to rank of Sqdn. Ldr. (March 1). The following Flying Officers are promoted to rank of Flight-Lt. (March 1) :—H. C. Lee, A. E. Hill, R. A. Wills.

The following Pilot Officers are promoted to rank of Flying Officer :—J. L. Barker, R. L. Moss (Jan. 6) ; W. D. T. Gairdner (Jan. 10); Sir A. P. Hope, Bt. (Jan. 13) ; J. A. S. Hodgson (Jan. 20) ; J. D. Ronald (Jan. 28).

The following are transferred from Class C to Class A :—Flt.-Lt. S. H. Potter (Dec. 1, 1932) ; F./O. T. O'N. East (Oct. 21, 1932) ; F./O. T. B. Fenwick (Jan. 25) ; F./O. E. G. L. Russell (Feb. 13). The following Flying Officers are transferred from Class A to Class C :—L. A. Lewis (Feb. 6) ; A. S. Wilcockson (Feb. 19).

The following Flying Officers are transferred from Class AA (ii) to Class C :—J. K. Lawrence (Aug. 24, 1932) ; J. W. Bradley (Oct. 1, 1932).

Flying Officer S. P. Scott relinquishes his commn. on completion of service (Feb. 26) ; Flt.-Lt. A. H. Dalton relinquishes his commn. on completion of service and is permitted to retain his rank (Jan. 17).

*Medical Branch*

F./O. G. Williams is transferred from Class AA (ii) to Class DD (June 15, 1932) ; B. A. Porritt, M.B., relinquishes his commn. on appointment to a commn. in the Indian Medical Service (Feb. 20).

### AUXILIARY AIR FORCE

*General Duties Branch*

No. 605 (County of Warwick) (Bomber) Squadron.—Pilot Officer F. W. Hancock is promoted to rank of Flying Officer (Jan. 22).

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointments in the Royal Air Force are notified :—

*General Duties Branch*

*Group Captain* C. W. Nutting, O.B.E., D.S.C., to No. 3 Flying Training School, Grantham, 17.1.33, to Command, vice G/Capt. R. H. Peck, O.B.E.

*Wing Commander* F. G. D. Hards, D.S.C., D.F.C., to H.Q., R.A.F., Mediterranean, Malta, 8.2.33, for duty as Fleet Aviation Officer to Commander-in-Chief, vice W/Cdr. G. G. H. Cooke, D.S.C., A.F.C.

*Squadron Leaders :* H. G. Crowe, M.C., to No. 23 (F) Sqdn., Biggin Hill, 16.2.33, to Command, vice S/Ldr. A. L. Paxton, D.F.C. G. H. Hall, A.F.C., to No. 1 School of Tech. Training (Apps.), Halton, 20.2.33, for Administrative duties in No. 1 (Apprentices) Wing, vice S/Ldr. C. Boumphrey, D.F.C. H. L. Macro, D.F.C., A.F.C., to Air Ministry, Dept. of Air Member for Supply and Research (D.D.R.M.), 13.2.33, for Engineer Staff duties, vice S/Ldr. C. Turner, A.F.C. W. E. Reason, to No. 1 Air Defence Group H.Q., 19.2.33, for Engineer Staff duties.

*Flight Lieutenants :* A. W. Franklyn, M.C., to No. 40 (B) Sqdn., Abingdon, 16.2.33. R. D. McE. Hart, to Home Aircraft Depot, Henlow, 19.2.33. D. H. Carey, to Aeroplane & Armament Experimental Estab., Martlesham Heath, 14.2.33. S. G. Connolly, to No. 22 Group H.Q., S. Farnborough, 16.2.33. R. L. Crofton, M.B.E., A.F.C., to R.A.F. College, Cranwell, 13.2.33. B. A. J. Crummy, to No. 207 (B) Sqdn., Bircham Newton, 20.2.33. W. G. E. Hayman, to No. 1 Sch. of Tech. Training (Apprentices), Halton, 18.2.33. R. J. A. Ford, to No. 14 (B) Sqdn., Amman, Palestine, 10.2.33. M. Lowe, to No. 2 Armoured Car Co., Ramleh, 6.2.33. R. L. Sweeny, to No. 2 Flying Training School, Digby, 21.2.33. H. N. Hampton, D.F.C., to No. 57 (B) Sqdn., Upper Heyford 23.2.33.

*Flying Officers :* L. E. Chiswell, to No. 13 (A.C.) Sqdn., Netheravon, 15.2.33. W. D. Dennehy, to No. 2 Armoured Car Co., Ramleh, 15.2.33. I. J. Neale, to No. 2 Flying Training School, Digby, 15.2.33. J. G. B. O'Hagan, to No. 99 (B) Sqdn., Upper Heyford, 20.2.33.

*Pilot Officers :* The undermentioned Pilot Officers are posted to R.A.F. Depot, Uxbridge, 21.2.33, on appointment to Short Service Commns. :—J. F. Hobler, H. G. Lee, W. W. E. Oliver, E. J. Palmer.

*Stores Branch*

*Squadron Leader* T. G. Skeats, to No. 3 Stores Depot, Milton, 19.2.33, for Stores duties, vice W/Cdr. G. Stevens, O.B.E.

*Flight Lieutenant* A. Walters, to Stores and Supply Depot, Aden, 28.1.33.

*Flying Officer* V. H. B. Roth, to H.Q., Iraq Command, Hinaidi, 10.2.33.

*Accountant Branch*

*Squadron Leader* T. C. Miller, M.C., to No. 5 Flying Training School, Sealand, 24.2.33, for Accountant duties, vice S/Ldr. W. G. W. Prall.

*Flying Officer* L. Chegwidden, to Marine Aircraft Experimental Establt., Felixstowe, 21.2.33.

*Flying Officer* P. Griffiths, to No. 84 (B) Sqdn., Shaibah, Iraq, 10.2.33.

*Medical Branch*

*Flight Lieutenants :* H. W. Corner, to H.Q., Inland Area, Stanmore, 22.2.33. A. S. Burns, to Aircraft Park, Lahore, India, 16.2.33. J. J. Corcoran, to Station H.Q., Heliopolis, 13.1.33. A. L. St. A. McClosky, to No. 4 Flying Training School, Abu Sueir, 1.2.33. F. L. White, to H.Q., R.A.F., Middle East, Cairo, 13.1.33.

*Flying Officer* O. S. M. Williams, to Station H.Q., Heliopolis, 29.1.33.

*Dental Branch*

*Flight Lieutenant* J. G. Stewart, to No. 3 Flying Training School, Grantham, 21.2.33.

### NAVAL APPOINTMENT

The following appointment has been made by the Admiralty: —

*Lieut. (F/O., R.A.F.).*—G. D. Anderson, to *Victory*, for R.A.F. Base, Gosport (Feb. 24).

## ROYAL AIR FORCE RESERVE

### New Flying Training Scheme

A NEW scheme of flying training for the Royal Air Force Reserve will be introduced on April 1 next. Training will take place thereafter on approved light aeroplane types, instead of on Service types, and a more comprehensive training programme, approximating more closely to Service practice, will be inaugurated.

The scheme will enable an increased amount of flying to be undertaken annually by all Reserve pilots without additional cost. This result will be achieved by the introduction of the light aeroplane type.

A certain number of vacancies exist in the Reserve at present for pilots of suitable age and education holding a civil "A" or "B" licence. Qualified civil pilots (under 28 years of age) who wish to take this opportunity of entering the Reserve under the new conditions should apply to the Air Ministry for the official forms of application. Vacancies also exist for *ab initio* trainees, who must be under 25 years of age.

**Details of the New Scheme**

The new scheme has two objects in view. First (as stated above), it will enable an increased amount of flying to be performed annually by all pilots without additional cost. At present, trained pilots carry out 12 hours' solo flying each year ; in future they will be required to undertake 20 hours' flying, including dual. A certain amount of additional flying will also be provided for. *Ab Initio* trainees, who have little or no experience in flying when they enter the Reserve, must do, under present conditions, 35 hours' flying in their first six months' of service ; under the new scheme they will do 50 hours.

Secondly, the training programme, both in flying and ground subjects, will be greatly extended and will approximate more closely to the training given to Service pilots.

The flying syllabus will include practice in aerobatics, "blind" flying, camera gun work and photography for all pilots, in addition to an increased amount of air pilotage. The training will be such as to enable pilots to

requalify, if necessary, on modern high performance Service types with a minimum amount of further instruction.

Training on flying boats will be substituted for the training hitherto given to selected pilots on floatplanes. This training will be exceedingly thorough, and a large measure of essential seamanship will be included in the syllabus of instruction.

Reserve officers with sufficient flying experience will also be given opportunities to attend special courses in "blind" flying and to take Instructors' Courses.

An improved syllabus of ground training will also be introduced, including ground instruction in airmanship, air pilotage, air armament and air photography. *Ab initio* trainees will also be specially trained in engine inspection and maintenance.

The flying training of the Royal Air Force Reserve is carried out at civilian flying schools situated at Bristol, Brough, Hamble and Hatfield, and the tuition is given by instructors who qualified while on the active list of the Royal Air Force and are now serving in the Reserve. Under the new scheme, instruction on landplanes will be given on approved light aeroplane types, such as the de Havilland "Tiger Moth," the Avro "Cadet" and the Blackburn "B.2." The Saunders-Roe "Cutty Sark" will be used for flying-boat tuition.

### Notes on the Royal Air Force Reserve and the Methods of Entry

The Reserve of Air Force Officers is composed of flying and technical branches. The flying branch is sub-divided into two main classes, A for officers who have served in the regular Air Force and AA for direct entrants from civil life.

Up to the present the flying Reserve has been largely dependent on wartime pilots, who have accepted Reserve obligations, to supplement the strength of officers passing to the Reserve from short service and medium service commissions, but as more and more of these wartime pilots reach the upper age limit of 38 the Reserve is becoming increasingly dependent on the direct entrants from civil life.

These Class AA direct entrants from civil life are drawn (i) from pilots who hold a civil "B" licence or "A" licence with sufficient flying experience to proceed direct to Reserve flying training, and (ii) from candidates who have little or no experience of flying and are trained in the Reserve *ab initio*. The latter are known as *ab initio* trainees and are required to attend at one of the Reserve flying schools for a period of not more than 91 days in their first six months of service. The training given during this period includes ground instruction as well as tuition in flying. Many of these *ab initio* trainees are university undergraduates who carry out their training in the Easter and Long Vacations. Undergraduates at any university are eligible to join the Reserve except members of the Oxford and Cambridge University Air Squadrons, who are not permitted to enter the Reserve while they are members of the squadrons.

Candidates for Class AA (i) (*i.e.*, with previous flying experience) must not have reached their 28th birthday, and candidates for Class AA (ii) (*i.e.*, with little or no previous experience) must not have reached their 25th birthday. They must be of good education and physically fit. Candidates whose applications are approved are interviewed by a selection board at the Air Ministry, and pass a medical examination prior to acceptance. A flying test for applicants for Class AA (i) may also be required. The initial period of engagement for each class is five years.

Pay and allowances are issued at R.A.F. rates to officers attending for training, and in addition a retaining fee of £25 is issuable annually.

Copies of Air Ministry Pamphlet 14, which contains full particulars as to entry into the Reserve, together with the necessary application forms, can be obtained from the Air Ministry on request.

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## C. Clarkson's New Post

UNTIL recently holding the position as Aviation Manager of Selfridge's Aviation Department, Mr. Christopher Clarkson has now been appointed General Manager to Brian Lewis & Co., Ltd. The two firms are, of course, as our readers know, closely linked, as Mr. Gordon Selfridge, Junr., is the Chairman of Brian Lewis & Co. Apart from this new appointment, the organisation of the latter firm will remain as before, with Mr. Brian Lewis Managing Director, Mr. Dudley Page Heston Manager, and Mr. W. Gairdner Manager of the northern branch at Hooton Park. Mr. R. Lindsay Neale will now be in charge of the Aviation Department at Selfridge's. Brian Lewis & Co. are, of course, one of the most prominent aircraft agents in the country, and handle the de Havilland products for London, north of the Thames, northern and eastern England and Scotland and Ireland.

## "Bripal"

A CINEMATOGRAPH demonstration of the methods of production and application of "Bripal" lacquering and painting was given by Brown Bros., of Great Eastern Street, E.C.2, at the Olympia Theatre, Shoreditch, on Tuesday, March 7. Among other interesting parts of the demonstration were the methods of testing all paints and varnishes in the open air for as long as two years, during which it is surprising to note the period of greatest deterioration was not during the rain and hail of the winter months but during the summer. Altogether the methods of testing, although rather too complicated to describe here, were of great interest, and even included demonstrations of specimen types of lacquer and paint subjected to artificial tropical conditions.

## The Air Force List

THE March issue of the Air Force List has now been published. It can be purchased (price 2s. 6d.) from H.M. Stationery Office at the following addresses:—Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh; 2, York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square, Belfast; or through any bookseller.

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## NEW COMPANIES REGISTERED

COMMERCIAL AIRWAYS (ESSEX), LTD., Loughton Aerodrome, Abridge, Essex. Capital £1,250 in £1 shares. The objects are to take an underlease of certain land at Piggotts Farm, Theydon Bois, Essex, to establish, maintain and work lines of aerial conveyances between Loughton Aerodrome, Abridge, Essex, and all other parts of the world, and to carry on the business of aerodrome and air transport service proprietors, etc. Directors:—Wilfred John Lewington (managing director), "Branscombe," Gilbert Street, Waltham Cross, Herts, haulage contractor. Walter R. Bannister, 201, Turners Hill, Cheshunt, Herts, air pilot. Herbert Smee Linwood, 31, Hertford Road, Lower Edmonton, N., fish salesman. George Lewington, 145, Hertford Road, Enfield Wash, Middlesex, garage proprietor. N. Kilian, "The Elms," Ferndale Road, Enfield Wash, Middlesex, hardware storekeeper.

ELY SERVICE MOTOR CO., LTD.—Capital £5,000 in £1 shares. Motor, aero and general engineers, proprietors of garages and service stations, etc. Permanent directors:—Charles A. Hull, 23A, Prickwillow Road, Ely, Cambs, motor engineer. Edward N. Bowyer, 21, Egremont Street, Ely, Cambs, motor engineer.

### Increase of Capital

POBJOY AIRMOTORS, LTD. (Manufacturers of aeroplanes, etc., Hooton Park Aerodrome, Hooton, Wirral, Ches.)—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £13,400.

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## PUBLICATIONS RECEIVED

*Thermodynamics Applied to Heat Engines.* By E. H. Lewitt, B.Sc. Pitman's Engineering Degree Series. London: Sir Isaac Pitman & Sons, Ltd. Price 12*s.* 6*d.* net.

*More About Heldite.* The Held Glue & Compounds Co., Ltd., Boar's Head Wharf, Brentford, Middlesex.

*The Hart Aeroplane (2-Seater Day Bomber);* Kestrel I. B. Engine. Air Publication 1404 (Vol. I). London: H.M. Stationery Office. Price 2*s.* net.

*P.M.G. Metals.* Vickers-Armstrongs, Ltd., Naval Construction Works, Barrow-in-Furness.

*Simplified Aerial Navigation by Dead Reckoning.* By J. A. McMullen. London: Charles Griffin and Co., Ltd. Price 5*s.*

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## AERONAUTICAL PATENT SPECIFICATIONS

*Abbreviations:* Cyl. = cylinder; i.c. = internal combustion; m. = motor.

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

### APPLIED FOR IN 1931

*Published March* 2, 1933

22,862. ECLIPSE AVIATION CORPN. Engine-starting apparatus. (387,309.)
32,736. PRATT AND WHITNEY AIRCRAFT CO. Rotary apparatus for preparing and supplying mixture to i.c. engines. (387,453.)

*Published March* 9, 1933

19,750. J. E. ELLOR. Air-cooled condensers for cooling systems for aircraft engines. (387,690.)
22,537. J. R. S. WHITING. Captive gliders, and aeroplanes for instructional purposes. (387,700.)
22,879. F. DUNCANSON. Aircraft structures. (387,719.)

### APPLIED FOR IN 1932

*Published March* 9, 1933

9,803. F. MAZZINI. Stiffened metal sheets for all-metal surface coverings of aeronautical machines. (387,869.)
13,845. D. R. ADAMS and T. G. ALLEN. Apparatus for indicating movements of the centre of gravity of aircraft. (387,887.)
16,815. G. L. R. J. MESSIER. Framework for the wings of aeroplanes. (387,904.)
19,697. A. E. NOBLE. Toy aeroplanes. (387,923.)
24,940. SIEMENS AND HALSKE AKT.-GES. Sparking-plug for aeroplane engines. (387,954.)